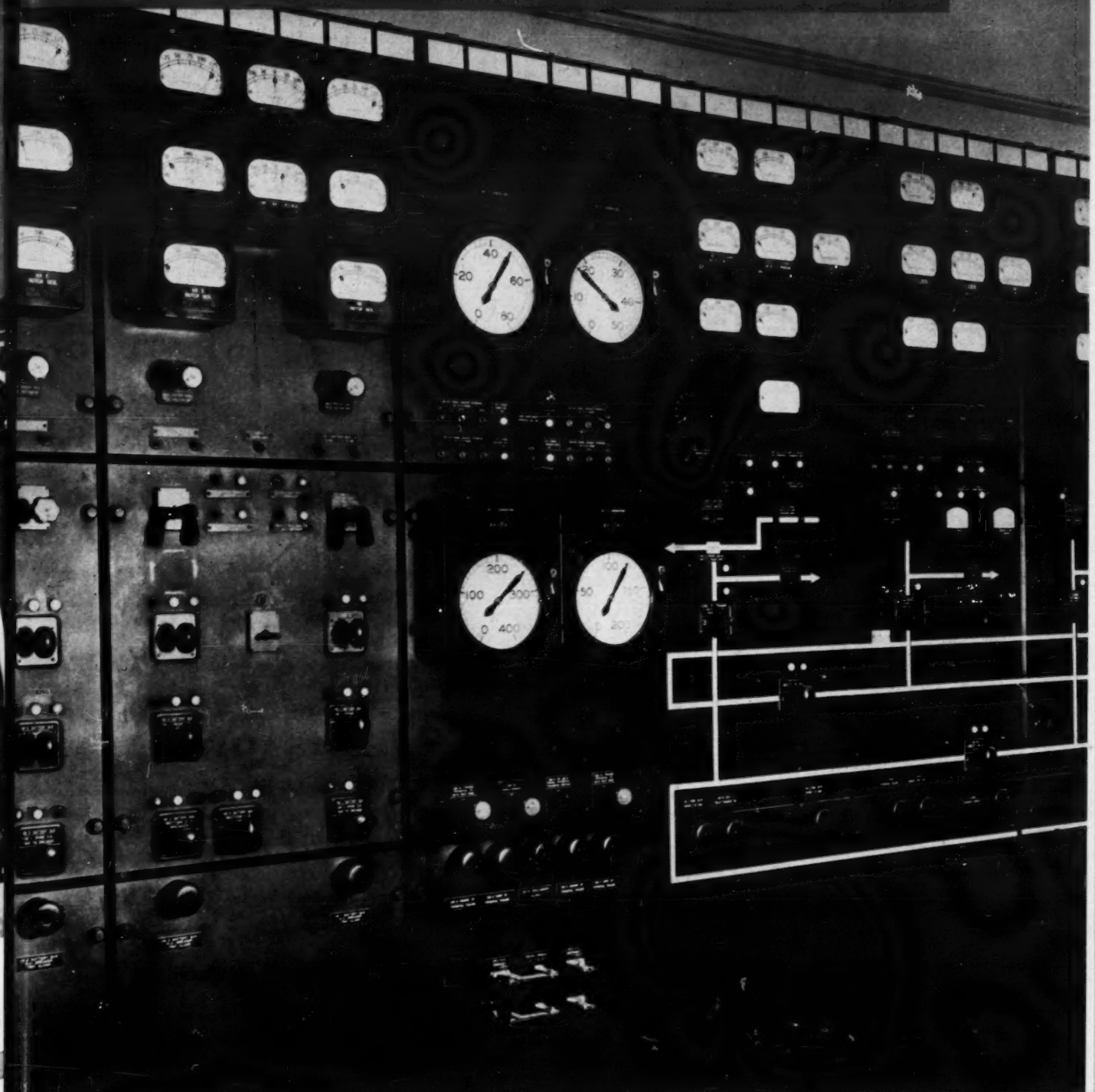
Electrical World

JANUARY 8, 1944



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. . . *through the war and beyond!*

The start of the new year finds instrument headquarters still *busy at it* in the final drive for victory. Dependable WESTON instruments, in all familiar types, continue flowing in unprecedented quantities to every battle front. *In new types, too;* for all during this period of stress WESTON development laboratories also have *led the way* . . . continually meeting the new measurement problems of this mechanized war. Thus when instrument priorities are relaxed, WESTONS will continue as industry's *standards* for all measurement needs. For, *new* measurement tools as well as *old* will be available in their most *trustworthy form* . . . here at instrument headquarters. Weston Electrical Instrument Corp., 616 Frelinghuysen Ave., Newark 5, N. J.

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Electrical World

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From .....

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To .....

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Signed .....

This cable resists:

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ACIDS

OILS

MOISTURE

Okolite-Okoprene cables successfully meet the hazards of industrial plant operation. Insulated with Okolite and protected by an Okoprene* sheath, they are heat resistant and can be used in circuits running near blooming mills, furnaces, soaking pits, boiler rooms, steam lines and pouring ladles. Resistant to the solvent action of grease and oils, Okoprene is not deteriorated by the cutting oils used on pipe-threading machines or by lubricating oils from cold-rolling mills. Acid problems existing near pickling and plating tanks are overcome by Okoprene. Over and above this, the toughness, flexibility and abrasion resistance of the Okoprene covering mean unexcelled ability to withstand mechanical abuse.

Okolite-Okoprene cables are made in a full range of capacities, and sizes for all electrical applications. Write for Bulletin OK-2009B. The Okonite Company, Passaic, N. J.

*A neoprene protective covering developed by Okonite for severe applications. Resistant to moisture, flame, oil and sunlight, Okolite-Okoprene cables can be installed in ducts, buried directly in the earth, or exposed to the elements—*without additional protection.*

3396

Okolite-Okoprene

THE OKONITE COMPANY
INSULATED WIRES AND CABLES

OKONITE

LITTLE DID WE KNOW, these 12 years while we were saying, "Electroline Automatic Line Splices are reclaimable" that the really big story had not yet been told.

Now this important reclaimable feature scores again. Vital materials from which Automatic Line Splices are made are mostly off to war . . . so it is impossible to supply the quantity of line splices we would like to but your stock bins will supply splices for immediate requirements.

Every "out of service" line equipped with Electroline Automatic Line Splices is a source of supply. These splices are reclaimable.

Electroline Splices can be removed in a jiffy. Back they go to stock bins for re-use . . . time and time again. Stock without stock expenditures. How's that for an "extra" dividend?

It is the everlasting quality of Electroline products that assures our users of adequate, effective usable Automatic Line Splices for the duration. The quality is there because long experience in this field has taught us how to put it there. Not only the first Automatic Line Splice, but also the first Reclaimable Line Splice came from the house of Electroline.

Electroline Company

Originators and Patentees of Automatic Line Splices and Dead Ends

4121 SOUTH LA SALLE STREET • CHICAGO 9, ILLINOIS

Tests to determine the faithfulness to specification of a given station insulator can be conducted in half an hour--all you really *know* about that insulator can be discovered in the first half-hour of its life. Yet, the most important thing of all is how long the insulator will stay in service, but no kind of testing will reveal this vital information to you...True, all reputable station insulators have the same physical characteristics; all adhere to rigid published specifications; all are alike--*for the first half-hour!*..Not in the first half-hour, but the first half-minute, you can discover the most important thing to know about a station insulator--that it was made by O-B. Long, trouble-free insulator performance can't be specified or predicted. You buy these qualities "on faith"; and the longest service records in the industry justify this faith when you specify O-B.

Ohio Brass

MANSFIELD, OHIO

CANADIAN OHIO BRASS COMPANY, LTD.,
NIAGARA FALLS, ONTARIO

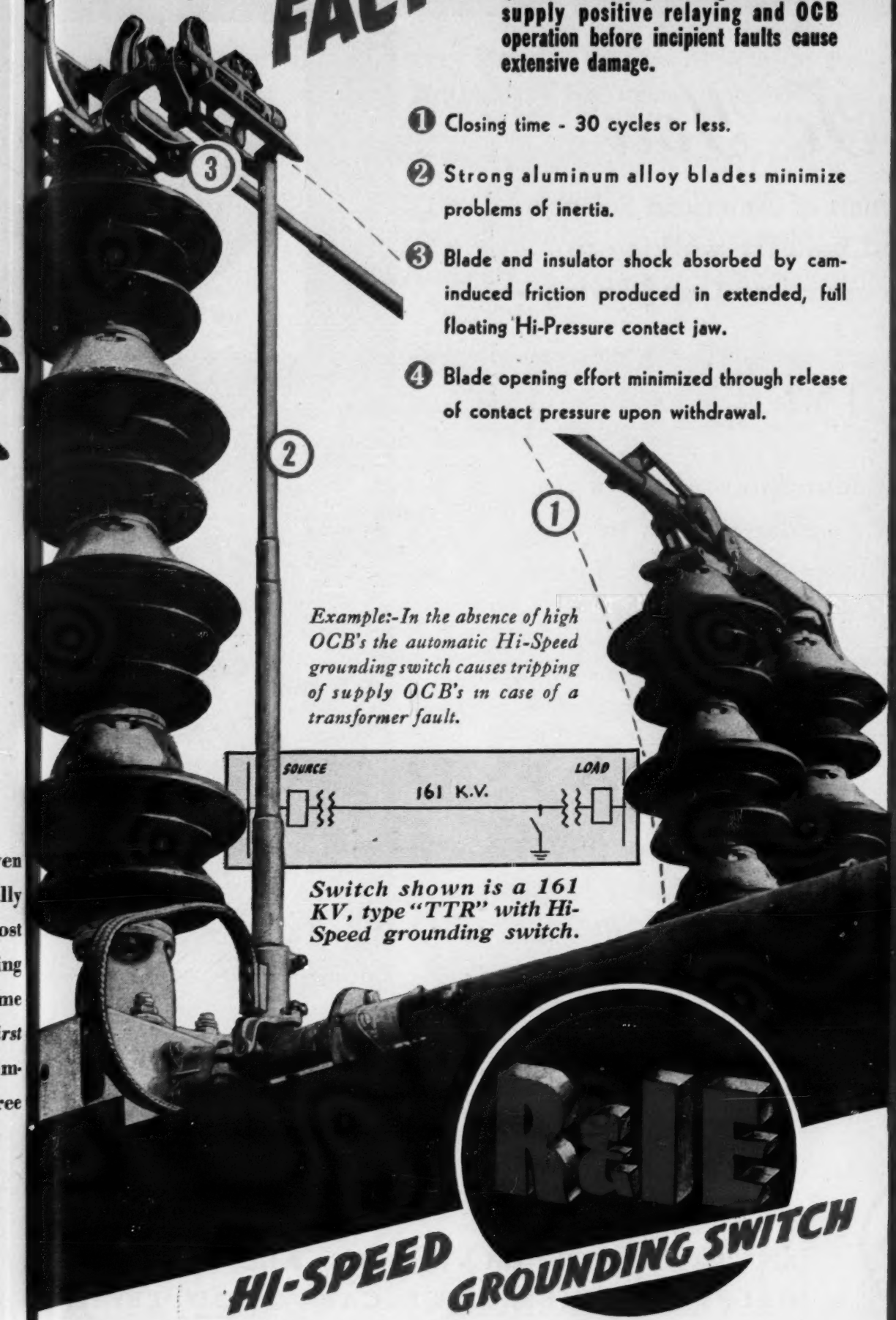
2465-H

★ *KEEP BUYING WAR BONDS* ★

HECK the FACTS

Protect transformers by using QUICK-ACTING grounding switches to supply positive relaying and OCB operation before incipient faults cause extensive damage.

1. Closing time - 30 cycles or less.
2. Strong aluminum alloy blades minimize problems of inertia.
3. Blade and insulator shock absorbed by cam-induced friction produced in extended, full floating Hi-Pressure contact jaw.
4. Blade opening effort minimized through release of contact pressure upon withdrawal.



Example:-In the absence of high OCB's the automatic Hi-Speed grounding switch causes tripping of supply OCB's in case of a transformer fault.

Switch shown is a 161 KV, type "TTR" with Hi-Speed grounding switch.

R&IE

HI-SPEED GROUNDING SWITCH

ILWAY AND INDUSTRIAL ENGINEERING CO., GREENSBU RG, PA.

CANADA—EASTERN POWER DEVICES LIMITED, TO RONTO

The Check List

- CONDUCTOR SUPPORT CLAMPS AND FITTIN
- ✔ DISCONNECTING SWITCH INDOOR AND OUTDOOR
- AIR BREAK SWITCH
- INTERRUPTER SWITCH
- CUTOUTS AND THERMO-RUPTERS
- SWITCH OPERATIN MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSE
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SECTIONALIZING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

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the men of American Science
and Industry working to
further American Good Living—

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our Radio Sponsorship of the
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World's Finest Concert Orchestra...

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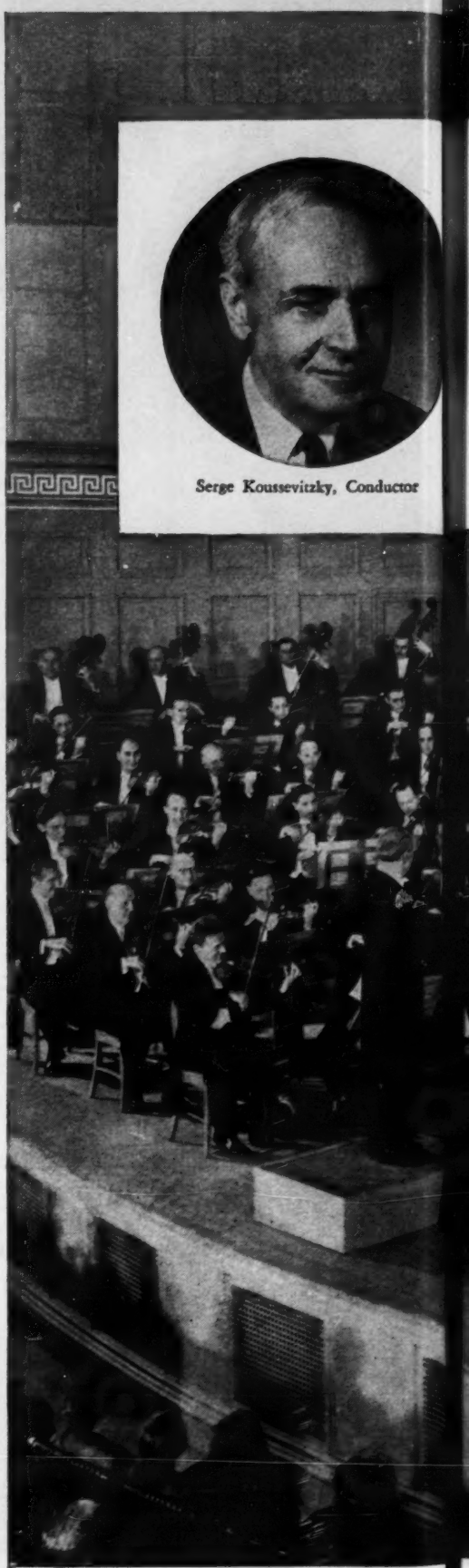
Every Saturday, at 8:30 p m (E.W.T.)
over 170 Stations of the Blue Network,
from New England to California.



Serge Koussevitzky, Conductor

ALLIS-CHALMERS MILWAUKEE AC

ENGINEERING THAT AIDS ALL INDUSTRY
HELPS FURTHER AMERICAN GOOD LIVING

Allis-Chalmers invites Every Reader of this Magazine to tune in next Saturday and every Saturday thereafter

MUSIC — sister to every science and industry furthering Good Living — is Allis-Chalmers' choice of radio entertainment for America.

In the words of Serge Koussevitzky, world-famous conductor of the Boston Symphony itself: "Today American audiences show not only their love and admiration of music, but also a deep understanding of the necessity and importance of musical art in the progress of humanity."

Americans also enjoy the highest standard of living of any people on earth — because they are the mightiest industrial nation on earth.

That is why we respectfully dedicate to *you*, the Men of American Industry, our radio sponsorship of the Boston Symphony.

Today over 1600 Allis-Chalmers products are helping America to the earliest possible Victory — *after the war*, the same engineering will mean Good Living, the American Way. ALLIS-CHALMERS, MILWAUKEE, WIS.

A 1686

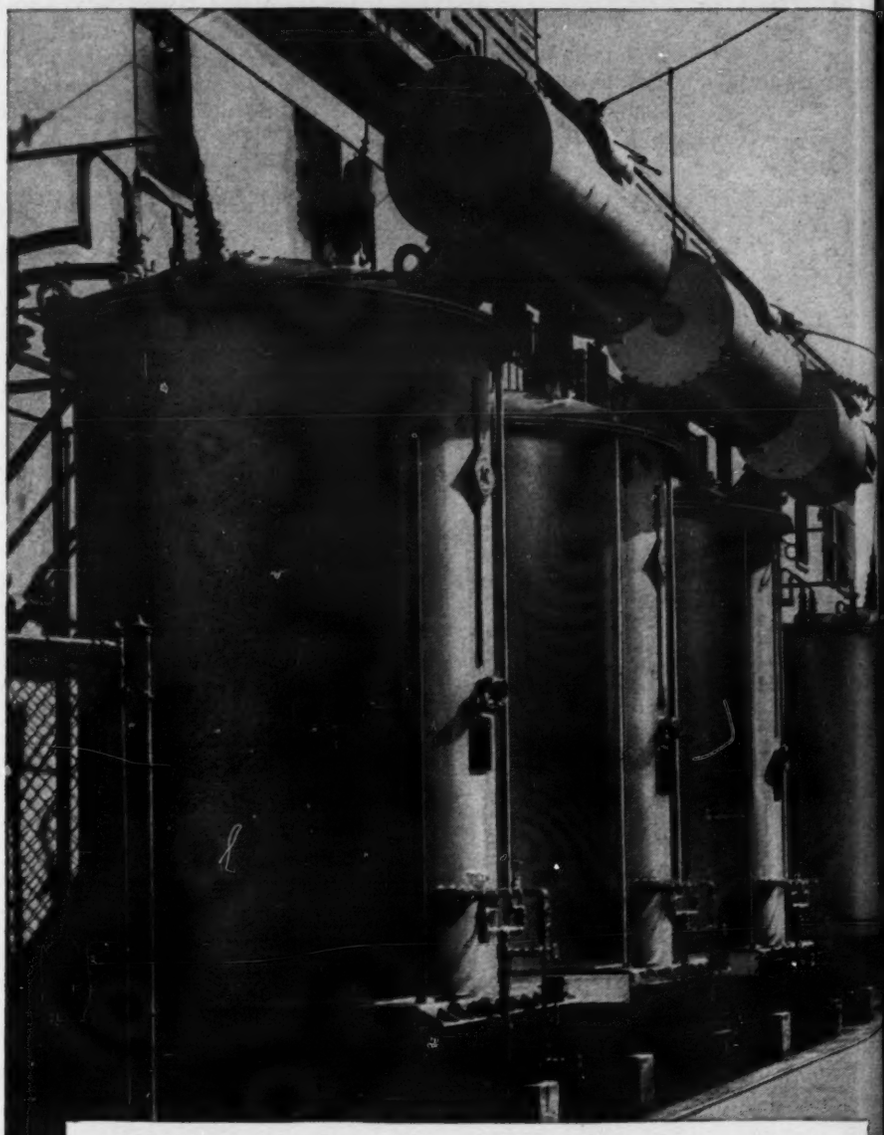
ALLIS-CHALMERS

NEW ALLIS-CHALMERS ELECTRO-
OF YOUR POWER TRANSFORMERS
HERE'S FORCED-OIL COOLING

★ By accelerating flow of oil with pump action — and by forcing cooling air over radiator surfaces — ELECTRO-COOLERS jump present capacity of most power transformers by as much as 60%. Installation is simple and quick!

★ New transformers built with ELECTRO-COOLERS use 25% less critical copper and steel than formerly . . . and cost you correspondingly less!

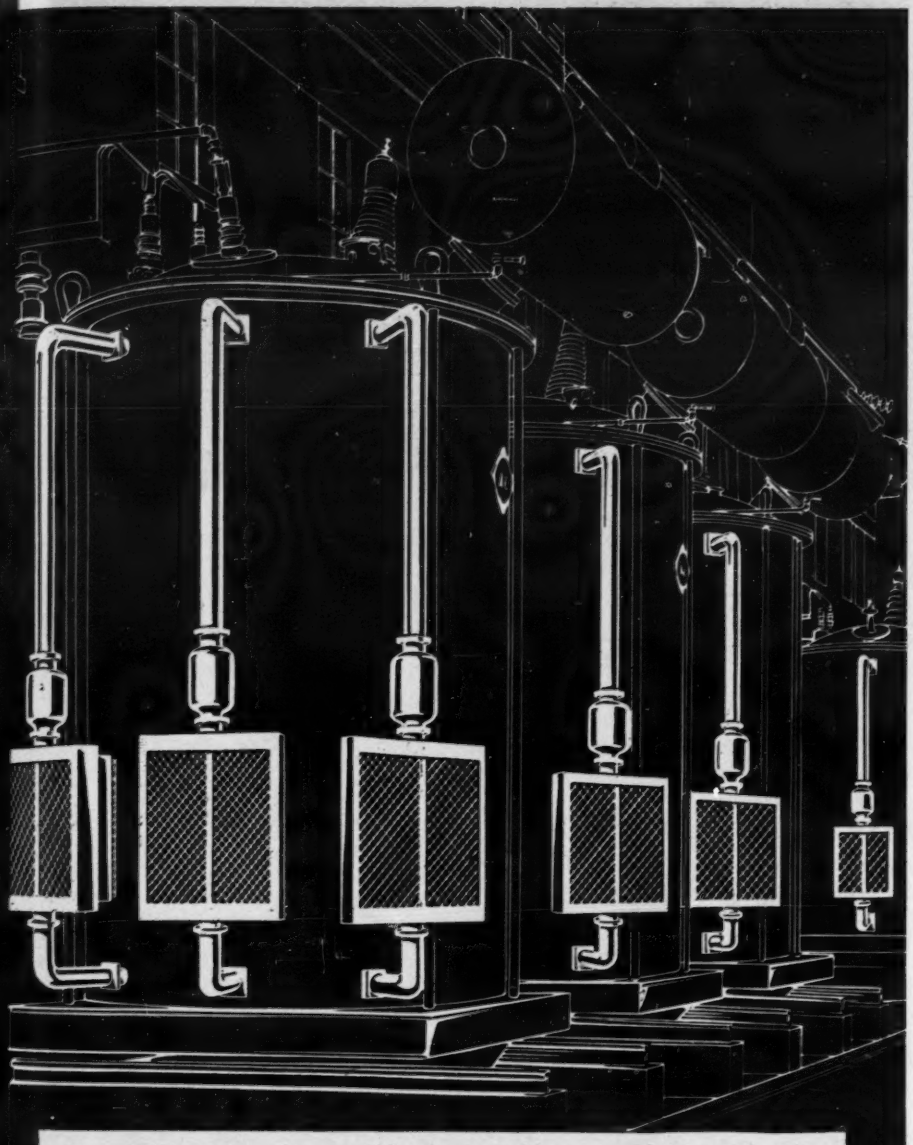
★ Allis-Chalmers new ELECTRO-COOLERS are self-lubricating . . . employ no glands or stuffing boxes . . . are simple, sturdy, practical. Here's a wartime investment with a great peacetime future!



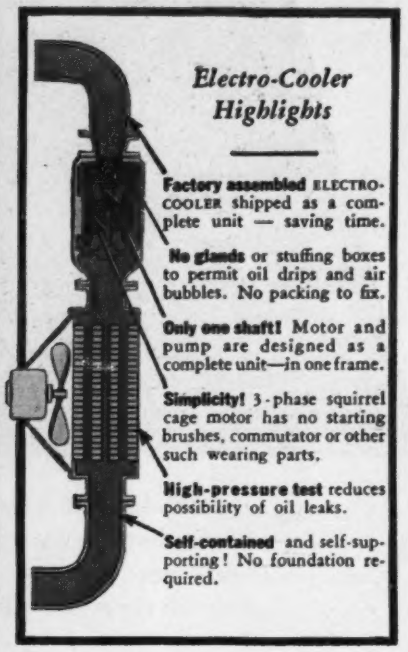
BEFORE: As a hypothetical case take this bank of three single-phase transformers. Water-cooled rating is 60,000 kva.

ALLIS-CHALMERS

COOLER CAN JUMP CAPACITIES 20-60%... AND IT'S PRACTICAL! AT ITS NEWEST AND FINEST..



AFTER: 96,000 kva would be the stepped-up rating of this power transformer bank if new ELECTRO-COOLERS were added.



Electro-Cooler Highlights

Factory assembled ELECTRO-COOLER shipped as a complete unit — saving time.

No glands or stuffing boxes to permit oil drips and air bubbles. No packing to fix.

Only one shaft! Motor and pump are designed as a complete unit—in one frame.

Simplicity! 3-phase squirrel cage motor has no starting brushes, commutator or other such wearing parts.

High-pressure test reduces possibility of oil leaks.

Self-contained and self-supporting! No foundation required.

WHETHER YOUR power transformers are water-cooled or self-cooled, new Allis-Chalmers ELECTRO-COOLERS can jump capacity 20-60%.

On water-cooled units ELECTRO-COOLERS eliminate water coils and coil service problems... reduce maintenance to a *minimum*.

Installation is simple because ELECTRO-COOLERS are self-contained and self-supporting.

For further information contact our nearby district office. Or write for bulletin B-6242. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 1640

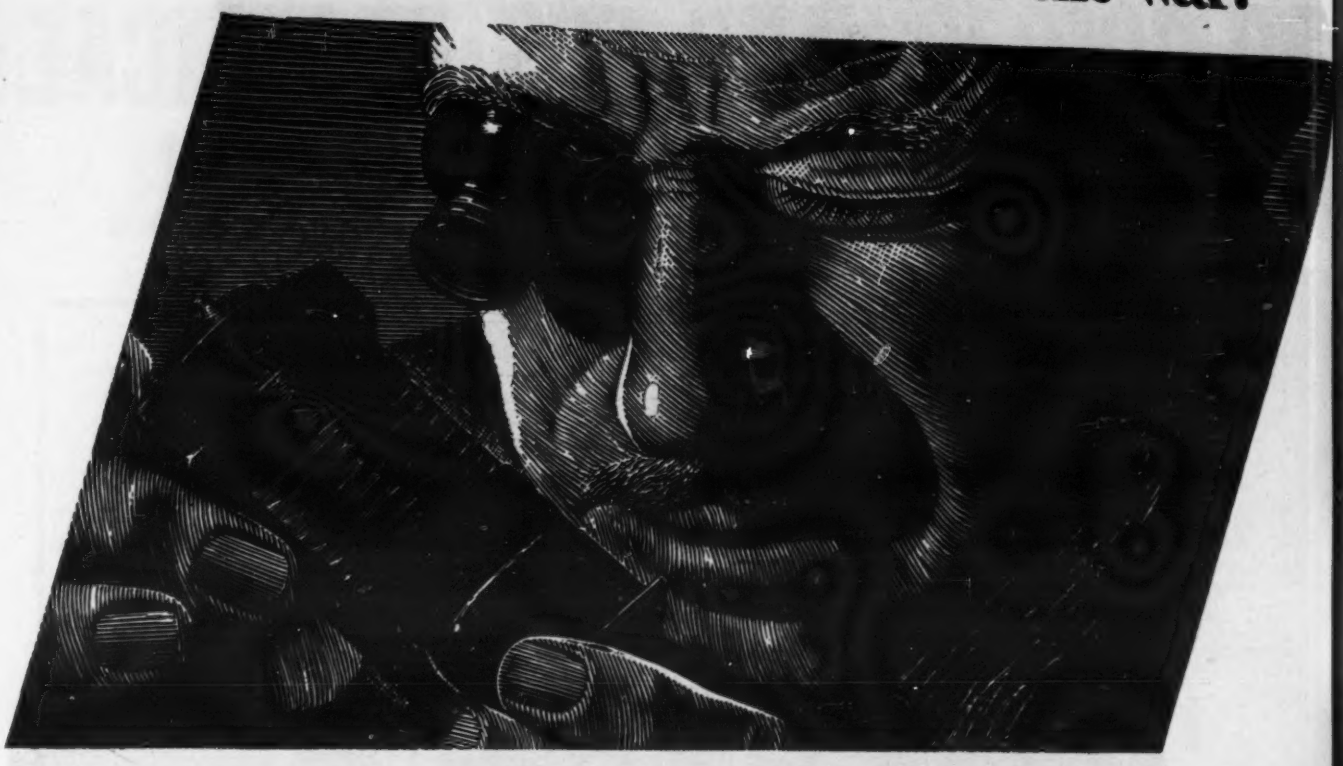
TRANSFORMERS

ALLIS-CHALMERS AC MILWAUKEE

WE WORK FOR VICTORY

WE PLAN FOR PEACE

Who can use this after the war?



So far this is definitely a war baby. It was born to meet an exacting wartime need. Every one that is made goes right into the fight.

It is an electric motor designed for jobs which no regular electric motor could fill.

The jobs are on America's fighting planes. Working control flaps—opening and closing cooling shutters—lifting landing gears—and the like.

Every ounce on an airplane is precious. So usual electric motors were out.

This one weighs as little as 8/10ths of a pound—others can move as much as 35 tons.

Naturally it took a whole new kind of engineering to make this motor.

It took new ideas from the drawing board up. It took new materials—like glass-insulated wire—to build it. It required finer, more precise craftsmanship than had ever gone into a motor before.

After the war, these motors can be sold to manufacturers of peacetime products.

That is why we are telling you about them now.

You may have need for such a compact, ultra-efficient source of power. You may be able to use the kind of engineering thinking that developed it—or the production technique that builds it and about 250 other Lear products.

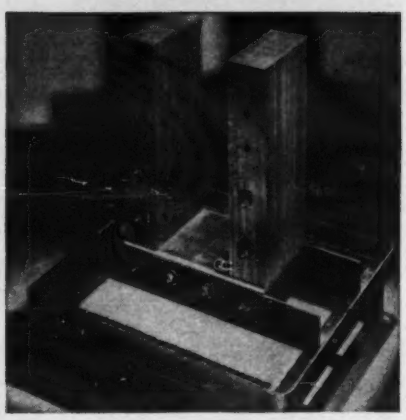
PLANTS: Piqua, O., and Grand Rapids, Mich. BRANCHES AT: New York, Los Angeles, Chicago, Detroit, Cleveland, Providence.

LEAR AVIA INC.
PIQUA · OHIO

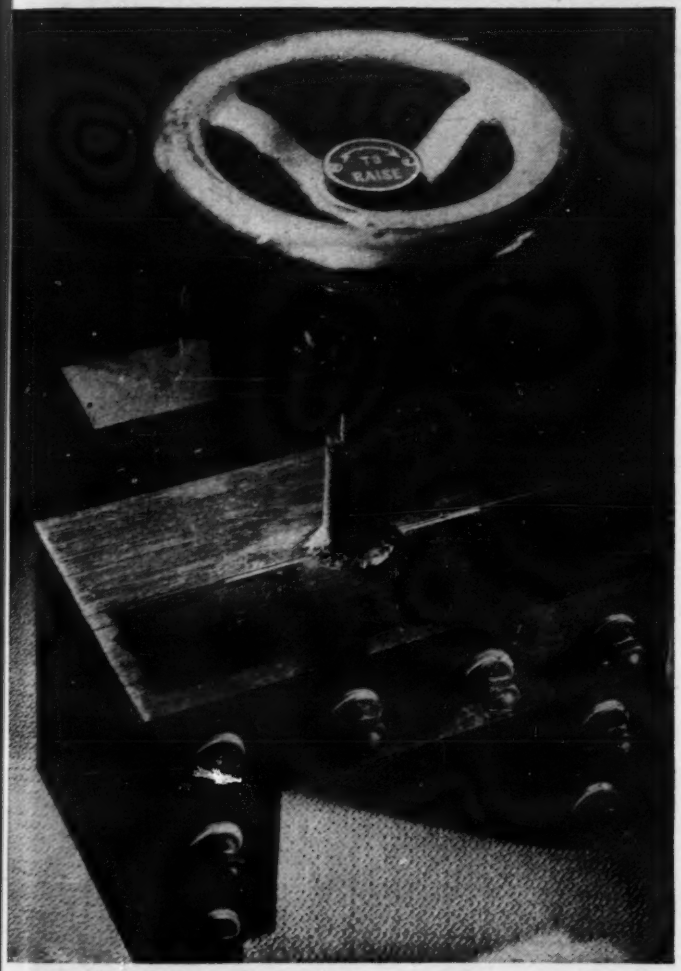
GET FINER AND FASTER A. C. WELDING WITH AMPAC "400"

1 Revolutionary new patented circuit *increases* efficiency — *cuts* idling loss! Entire construction is *simple, rugged!*

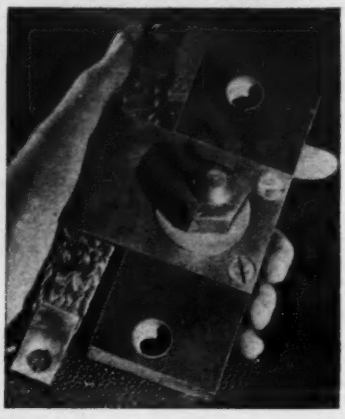
2 Transformer coil uses *rectangular* copper — glass-insulated — with primary over secondary. Air duct between windings dissipates heat — *prevents* breakdown!



3 Sturdy lower core is 1-piece, U-shaped . . . of die-punched silicon steel. Insures quiet operation . . . with *no* power-wasting air gaps!



6 Power regulation is *smooth — quick — simple!* One-inch movement of upper core covers entire welding range — 50 to 500 amps — in *seven turns* of control wheel. Cuts adjustment time to *minimum*. Speeds welding! A 1677



4 Here's typical Ampac quality — a big, tough, *extra heavy* welding terminal. Note *brazed* connections!

5 Hardened brass guide is simple, fool-proof! Channel shape provides *extra* strength.

GET COMPLETE FACTS on this brilliantly engineered a.c. welder from your nearby Ampac dealer or Allis-Chalmers district office. Ask for bulletin B6302. For data on new Ampac "200" welder, ask for bulletin B6241.

ALLIS-CHALMERS

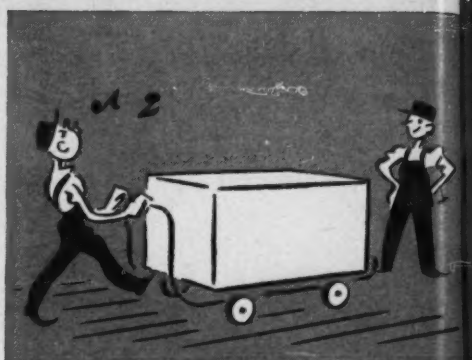
MILWAUKEE, WISCONSIN

FIGHT FRICTION!

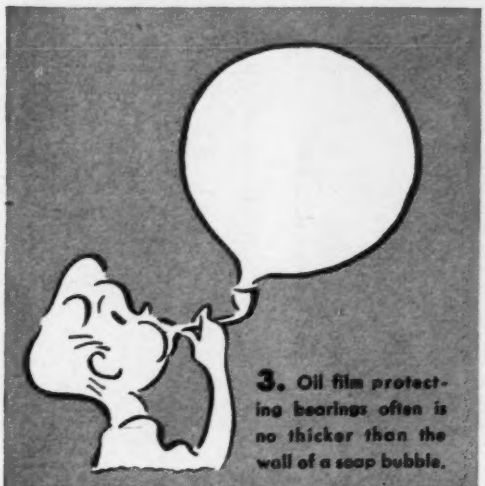
It's Electric Motor Enemy No. 4...

In Allis-Chalmers' new "Guide to Wartime Care of Electric Motors".

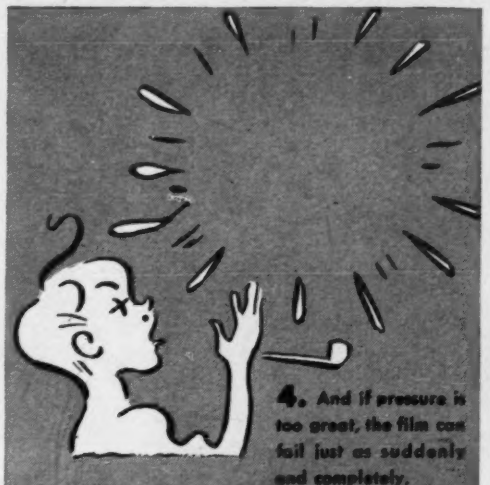
1. Like a motor without oil. Simple! Yet every day hundreds of workers overlook the importance of adequate motor lubrication.



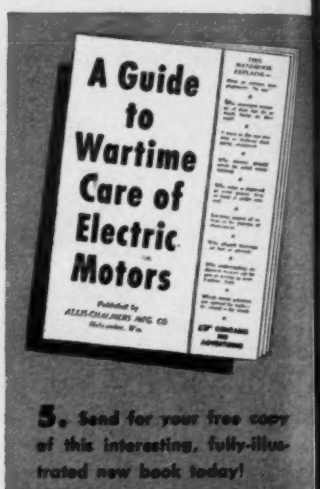
2. Like a motor with oil. Pictures like these make motor maintenance easy to put across in training new employees.



3. Oil film protecting bearings often is no thicker than the wall of a soap bubble.



4. And if pressure is too great, the film can fail just as suddenly and completely.

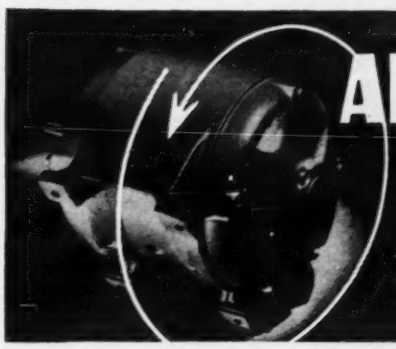


5. Send for your free copy of this interesting, fully-illustrated new book today!

ONE OF A MOTOR'S most dangerous enemies is friction. In peacetime, instructions for guarding against it were based on 8-hour-day, 6-day-week operation. Today, with motors working up to *3 and 4 times* as many hours a week, those instructions are dangerously obsolete!

To help put U. S. motor maintenance on an efficient wartime footing, Allis-Chalmers has published "Guide to Wartime Care of Electric Motors". This valuable book explains the *9 main enemies* of electric motors... tells you how to fight them. Its recommendations are simple and practical... ideal for training new men or as a review for experienced men. Book is fully illustrated with stimulating, understandable sketches like those shown above—*contains no advertising.* Over 100,000 copies in use by industry and armed forces. Send for your *free* copy today! ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WIS.

A 1658



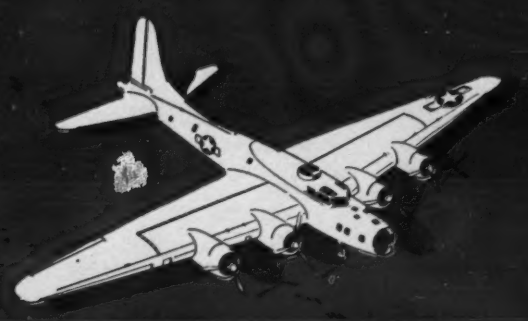
ALLIS-CHALMERS MOTORS

When you do need new motors, look into the strength, solidity and all-around protection of the new "Safety Circle"—protected top, sides, ends and bottom.

WE WORK FOR VICTORY — WE PLAN FOR PEACE

Bombers

NEED BUS BARS, TOO



With electric motors for a bomber's accessory equipment ranging into dozens of horsepower, considerable electricity has to be distributed to many points throughout the plane. Bus systems have become regular networks—"like all downtown", says one engineer—so that their weight introduces a serious problem.

Aluminum buses, in the sizes and forms pictured above, are helping to take care of this weight problem. For aluminum, as you know, though high in current-carrying capacity, is likewise light in weight. Aircraft engineers are profiting by the properties of aluminum which long ago led electrical men to adopt it for *their* power lines and buses.

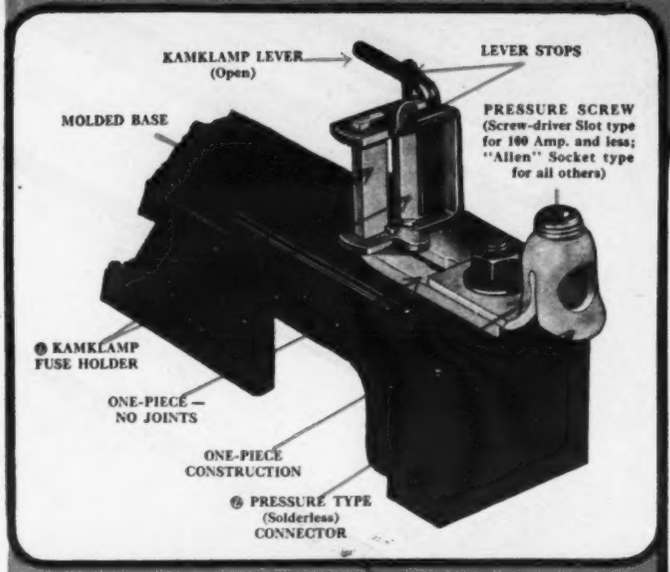
Whether your specialty is airplanes, power lines, heavy machinery, walkie-talkies or household appliances, versatile aluminum offers you many other advantages. It is nonmagnetic, nonsparking and nontoxic. It is an excellent conductor of heat and reflector of light. Its ability to resist corrosion is, of course, well-known.

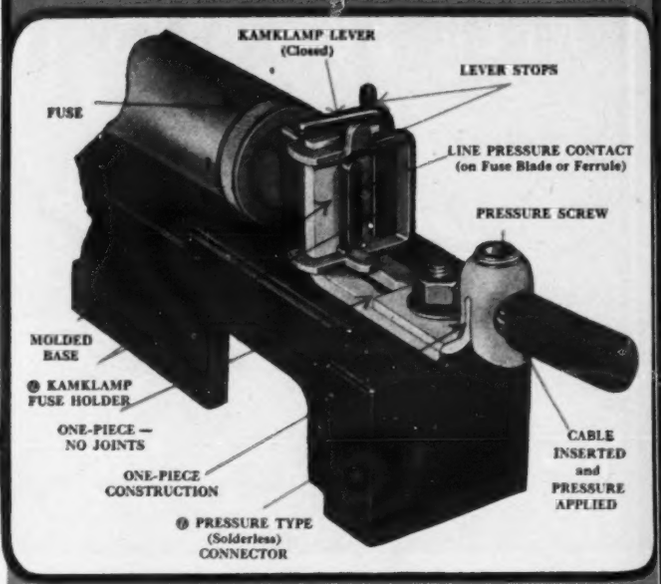
Manufacturers of materials for war are constantly discovering new ways of bettering their products by employing Alcoa Aluminum. Our engineers are available for assisting in this work. ALUMINUM COMPANY OF AMERICA, 2138 Gulf Building, Pittsburgh, Pennsylvania.

IMAGINEERING AT WORK

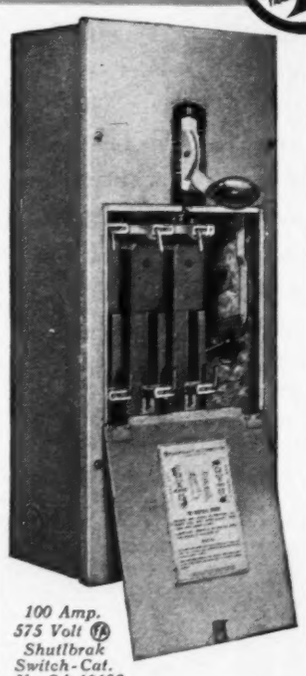
ALCOA A·C·S·R

• a Tightly held Fuse means A MORE PERFECT CONNECTION


KAMKLAMP LEVER (Open)
LEVER STOPS
MOLDED BASE
PRESSURE SCREW (Screw-driver Slot type for 100 Amp. and less; "Allen" Socket type for all others)
Ⓕ KAMKLAMP FUSE HOLDER
ONE-PIECE — NO JOINTS
ONE-PIECE CONSTRUCTION
Ⓕ PRESSURE TYPE (Solderless) CONNECTOR



THE INGENIOUSLY DESIGNED Ⓕ KAMKLAMP FUSEHOLDERS ON FA SHUTLBRAK *Switches*



100 Amp. 575 Volt Ⓕ Shutlbrak Switch-Cat. No. SA-10633

MAINTENANCE NOTE

All electro-mechanical apparatus requires intelligent maintenance to produce the most satisfactory service You will find helpful our free booklets on "Maintenance."

clamp the fuses tight. Insert the fuse —turn the lever—and you have a copper-to-copper connection under strong and continuous pressure.

Convenient, too, are the Ⓕ Pressure Type (Solderless) Connectors, which make possible quick, sure connections with both line and load wires or cables—connections which will not "ease up" or become loose.

Because of these and other outstanding advantages, plants producing war materials have purchased thousands of these switches. Some are used singly—others are banked in groups — or assembled in well-designed switchboards or panelboards. Still others are installed as plugin units for Ⓕ Busduct.

But wherever and however used, this heavy duty industrial switch is giving efficient, dependable service —on motor circuits—at service entrance—and on installations requiring an operating switch.

Ⓕ Shutlbrak Switches are available for both surface and flush mounting. Installation and connection are expedited by the ample wiring space at top, bottom and at rear of the switching mechanism, and by the conveniently placed knockouts.

Capacities: 30 to 1200 amperes, inclusive, for 250 volts AC or DC, and 575 volts AC, in 2, 3 and 4 pole types. Approved by Underwriters' Laboratories, Inc.

For Detailed Information

and suggested specifications for Ⓕ Shutlbrak Switches, Panelboards and Switchboards, write for Bulletin No. 70 . . . Frank Adam Electric Co., Box 357, St. Louis, Mo.

EST. 1891 — THE SIGN OF A FA BETTER JOB
Frank Adam
ELECTRICAL PRODUCTS
for War Industry
FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

USERS GAIN IN MANY WAYS...

WITH AMERTRAN DRY TYPE TRANSFORMERS

EVEN in the best designed plants there are spots where costs can be cut and efficiency improved with AmerTran Dry Type Transformers. A step-down from your 460 volt circuit will enable you to pull out badly *underloaded* motors and utilize fractional horsepower motors as more efficient units for light work. Or you can gain the lower industrial rate for lighting. You can make your power circuits an economical source of low voltage for heating, heavy circuit testing, etc., by means of an AmerTran Dry Type Transformer.

AmerTran Dry Type Transformers are available for outdoor or indoor location. They are used for such applications as insulating circuits, balancing loads on three-phase systems, boosting line voltages and phase changing. A complete description of AmerTran Dry Type Transformers for these applications will be furnished upon request.

AMERICAN TRANSFORMER COMPANY
178 EMMET STREET · NEWARK 5, NEW JERSEY

Pioneer Manufacturers of Transformers, Reactors and Rectifiers for Electronics and Power Transmission

AMERTRAN

MANUFACTURING SINCE 1901 AT NEWARK, N. J.

"Job Proven"

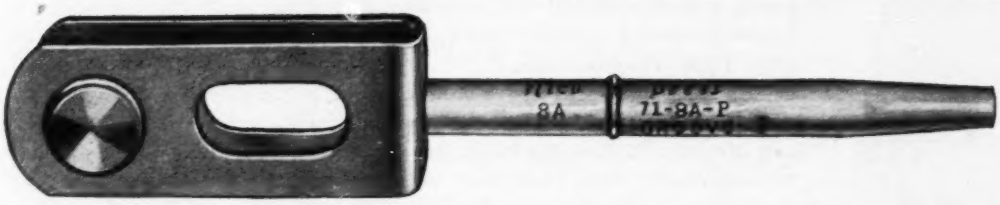
BY LINEMEN THE COUNTRY OVER

Rugged easy to operate Nicopress tool for making perfect line splices.

Completed Nicopress joint on line wire.

Nicopress Repair Sleeve for A.C.S.R.

Nicopress Reducing Sleeve for splicing wires of different sizes.



Nicopress Suspension Dead Ends for use with disc insulators.

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY

SINCE 1869, electricity and GRAYBAR have grown up together. Through peace and war, with every electrical advance, GRAYBAR has extended its distribution services in step with the needs of the day . . . and of the Nation.

Sure, it's something for GRAYBAR to be 75 – but all the busy years behind us mean nothing to you, or to America, except as they have improved our perspective for today's first job.

In a modern war, every industrial method or technique is a weapon matched against the production forces of the enemy. In your job, you have to help outclass some of Hitler's crowd this very morning. So have we at GRAYBAR, and we can't do it with our heads turned toward the past.

Thus, we're chiefly glad to be 75 because the amassed experience of those years – the long slow process of "learning the ropes" – is helping us meet each new and critical problem of electrical supply and distribution better than we could hope to do as a youngster at the game. And we can't imagine a better use to make of it.

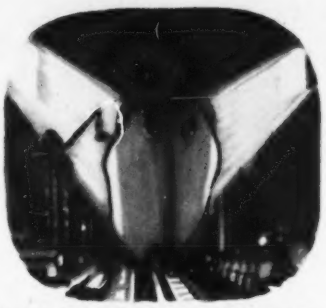
Beyond that, we think the perspective of many years of peace-time electrical progress – antedating even lamps and motors – will help us to serve you better in the "conversion" and post-war years. (As for the jubilation, we'll save that to add to yours on V-day!)

GraybaR

IN OVER 80 PRINCIPAL CITIES

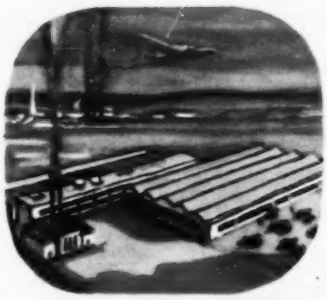
First Service of Supply

GRAYBAR *in War*



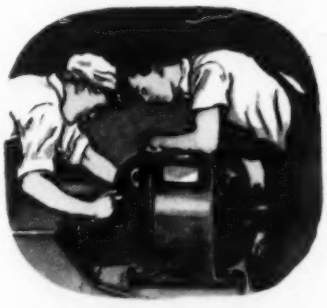
PRODUCTION SUPPLY

Electrical parts and materials to be installed in ships, planes, communications units and other "fighting front" equipment are GRAYBAR'S No. 1 responsibility today. With them goes specialized service to aircraft plants, shipyards and all other key war plants; on selection, application procurement and scheduled delivery.



CONSTRUCTION SUPPLY

Back of America's mighty war plant—military and industrial—is a phenomenal construction job. Electrical contractors, engineering firms and the military services engaged in the work depended upon GRAYBAR as a time-saving connecting link with the makers of thousands of different electrical construction items.



MAINTENANCE SUPPLY

To keep our productive machine running full-tilt, to distribute power, to light the work, and maintain communication lines, GRAYBAR speeds electrical replacement parts to points of greatest need. Emergency procurement "via GRAYBAR" has saved millions of productive man-hours.

Grayba

MOBILIZATION POINTS IN OVER 80

Executive Offices: GRAYBAR BLDG., NEW YO

Bringing together more than 2

...for an Electrical Nation

GRAYBAR *in Peace*

CONTRACTOR'S SUPPLY

The peacetime job of reequipping America electrically will get its start with electrical contractors: Plants, homes, offices, institutions, stores and buildings of every type will be demanding conversion and betterments. To contractors, GRAYBAR will once more bring the newest and best in wiring materials, lighting units, signaling equipment.

APPLIANCE DEALER SUPPLY

To dealers handling electrical appliances, GRAYBAR will again be back with the fast-moving popular items that help build a sound and solvent business. With so much new and untried merchandise coming to market, you'll appreciate GRAYBAR'S help in selecting the better lines.

REHABILITATION SUPPLY

Distribution services, tailored to the the electrical reconversion needs of industrial plants, public utilities, municipalities, railroads, telephone companies, etc., will be more essential than ever. Experienced GRAYBAR specialists will again be devoting themselves to the special electrical needs of each such group.

...facturers . . . 20,000 customers

Teamwork...DOWN THE YEAR

On its 75th Anniversary, GRAYBAR is proud of its long-lasting relationships with leading suppliers. This intimate contact assures you of more complete product information, greater support in expediting emergency orders, and twofold co-operation in assuring a satisfactory purchase.

BEFORE 1900

Alabax Division of Pass & Seymour, Inc.
American Crossarm and Conduit Company
American Electrical Heater Co.
American Steel & Wire Company
The Ansonia Electrical Company
The Arrow-Hart & Hegeman Electric Co.
Boston & Lockport Block Co.
The Bryant Electric Company
Calculograph Company
Crouse-Hinds Company
Diamond Expansion Bolt Company, Inc.
Edwards and Company
The Electric Storage Battery Co
General Cable Corporation
General Electric Company
Habirshaw Cable and Wire Div. Phelps Dodge Copper Products Corporation
Harvey Hubbell, Inc.
Jefferson Electric Company
Leach Company
Mathias Klein & Sons
National Carbon Company, Inc
National Pole & Treating Co
The Okonite Company
Owens-Illinois Glass Company Hemingray Division
Self-Winding Clock Co., Inc.
Stanley & Patterson Division Schwarze Electric Company
The Thomas & Betts Co.
Western Electric Company
Weston Electrical Instrument Corporation
The Whitney Blake Company

BEFORE 1910

Frank Adam Electric Co.
Benjamin Electric Mfg. Company
Boston Wove Hose & Rubber Co.
Columbia Metal Box Co.
Hamilton Beach Company Division of Scovill Manufacturing Company
The Holtzer-Cabot Electric Co.
Hubbard and Company
Ilg Electric Ventilating Co.
Indiana Steel & Wire Company
International Creosoting & Construction Co.
McGill Manufacturing Co., Inc Electrical Division
National Electric Products Corp
National Fireproofing Corp.
The National Telephone Supply Company
Simplex Wire & Cable Co
Square D Company Switch and Panel Division
Veeder-Root, Inc. The Wiremold Company

BEFORE 1920

BullDog Electric Products Co
Bussmann Mfg. Co
A. B. Chance Co. Utilities Division
Churchill Cabinet Company
Curtis Lighting
Dossert & Co., Inc.
Economy Fuse & Manufacturing Company
Edison General Electric Appliance Company, Inc.
Thomas A. Edison, Inc.
Faries Manufacturing Company
The Fibre Conduit Comany
Fullman Manufacturing Co.
The Gray Manufacturing Co
Kopp Glass, Inc.
Ward Leonard Electric Company
Manning, Bowman & Co.
Mitchell-Rand Insulation Co., Inc
Frank W. Morse Co
Mueller Electric Co.
National Lead Co.
National Sewing Machine Co
Philadelphia Electrical & Manufacturing Co.
Russell & Stoll Co., Inc.
H. B. Sherman Manufacturing Co
Templeton, Kenly & Co.
The Trumbull Electric Mfg. Co
Union Insulating Co.
The F. W. Wakefield Brass Co.
The Youngstown Sheet and Tube Company

BEFORE 1930

The Adjustable Fixture Company
Appleton Electric Co.
Armstrong Cork Company, Inc
Blaw-Knox Company
L. S. Brach Mfg. Corp.
J. H. Bunnell & Co., Inc.
Chase Brass & Copper Co., Inc.
Chicago Flexible Shaft Company
Clayton & Lambert Mfg. Co.
Coffing Hoist Company
Cook Electric Company
T. J. Cope, Inc.
Copperweld Steel Co.
Day-Brite Lighting, Inc.
Electrical Engineers Equipment Company
Elkhart Rubber Works
Ericson Mfg. Co.
The Everstick Anchor Co
Fahnestock Electric Co.
Federal Electric Company
The Four Wheel Drive Auto Co. Eagle Division
Frankel Connector Co., Inc
General Radio Company
The A. C. Gilbert Company
Greenlee Tool Company
Hankscraft Company, Inc
Hart Mfg. Co., Inc.
Hub Electric Corporation
Ideal Commutator Dresser Co.
Inland Glass Works Division of Chamberlain, Inc.
Kester Solder Co.
The H. R. Kirkland Company
Kleigl Brothers
Leeds & Northrup Company
Leich Electric Co.
The Linen Thread Co., Inc.
Lufkin Rule Company
W. N. Matthews Corp.
McEvoy Cord & Cable Co., Inc.
McGraw Electric Company
Minnesota Mining & Mfg. Co.
Murlin Mfg. Co.
Northern Industrial Chemical Co.
H. K. Porter, Inc.
Radiotron Division R.C.A. Mfg. Co.
Reliable Electric Company
Revere Clock Company
Revere Electric Mfg. Co.
Reynolds Electric Co.
W. H. Salisbury & Company
SherwinWilliams Co.
Steel City Electric Co.
Steel and Tubes Division Republic Steel Corporation
Stromberg Carlson Company
Struthers Dunn, Inc.
The Swartbaugh Mfg. Co.
Telkor, Inc.
The Thompson Electric Co
The Union Metal Mfg. Co.
United Metal Box Co.
United Motors Service, Inc.
Warren Telechron Company
Weber Electric Company
Webster Electric Company
Wesix Electric Heater Co.
Wheeler Reflector Company
Edwin L. Wiegand Company
Daniel Woodhead Company

BEFORE 1940

L. B. Allen Co., Inc.
American Brake Shoe & Foundry Co
American Manufacturing Company
The Art Metal Company
The Autocall Company
Burgess Battery Company
Century Lighting, Inc.
Colt's Patent Fire Arms Mfg. Co.
Cordley & Hayes
Corning Glass Works
Cory Glass Coffee Brewer Co
Dazor Mfg. Co.
W. C. Dillon & Company, Inc.
The Duff-Norton Mfg. Co.
The Emerson Electric Mfg. Co
G & W Electric Specialty Co
The P. A. Geier Company
Gibson Electric Refrigerator Corp
Gillinder Brothers, Inc.
Gleason-Tiebout Glass Co.
Greist Mfg. Co.
A. E. Halperin Co., Inc
Hobart Mfg. Co.
Horni Signal Mfg. Corp
Independent Pneumatic Tool C
Jensen Radio Mfg. Co.
Kelvinator Div. of Nash-Kelvinator Cor
Knox Porcelain Corp.
Landers, Frary & Clark
Lewis Sanitary Tool Co.
Lorain Products Corporation
Hugh Lyons and Company
McCabe-Powers Auto Body Co
The Mercoid Corporation
Mica Insulator Company
Mineraliac Electric Co.
Mitchell Manufacturing Co.
National Enameling & Stampi Company
Noblitt-Sparks Industries
Noma Electric Company
Ohio Brass Company
Owens-Corning Fiberglass Cor
Par-Metal Products Corp.
Philco Corporation Storage Battery Division
Pittsburgh Reflector Co.
Premax Products Division of Chisholm Ryder Co., Inc.
Prime Mfg. Co.
Proctor Electric Company Div. of Proctor & Schwartz
Raytheon Manufacturing Co. Electrical Equipment Divisi
Rival Mfg. Co.
St. Louis Cordage Mills
Sangamo Electric Company
Scanlon-Morris Co.
Seymour Smith & Son, Inc.
Silvray Lighting, Inc.
Sonora Radio & Television Co
Southern Asbestos Co.
Steam-O-Matic Corp.
Steber Manufacturing Co.
Stewart-Warner Corporation
Superior Neon Products Comp
Teletype Corporation
Thermador Electrical Mfg. Co
Triangle Conduit & Cable Co.
The Utica Drop Forge & Tool C
Vulcan Electric Co.
Waring Corporation
Western Block Co.

SINCE 1940

Andertube Manufacturing Co
Betts & Betts Corp.
Detroit Macoid Corporation
The Dexter Company
R. W. Fieroh Company, Inc.
Peter Gray, Inc.
Heinze Electric Co.
Holophane Co., Inc.
International Derrick & Equipment Division of International St Corp.
Justrite Manufacturing Compa
Killefer Manufacturing Corp
Lister-Blackstone, Inc.
Donald P. Mossman, Inc.
Paragon Electric Co.
Perkins Marine Lamp and Hard Corp.
Precision Castings Co.
Seamless Rubber Co.
F. A. Smith Mfg. Co., Inc.
Smoot-Holman
Surprenant Electrical Insulati
The Tappan Stove Company
Viking Instrument Co.
E. R. Wagner Mfg. Company
Walker Electrical Company
Wilcox, Crittenden & Co.
Willard Storage Battery Co.
Wilson Welder and Metals Co.

To Bring Them Back More Quickly

To the 503 GRAYBAR employees now in service, the "home folks" in offices and warehouses have pledged unstinted support. If service in your behalf can help to end the war more quickly, your call will get "all-out" co-operation – day or night.

★
503

GraybaR
IN OVER 80 PRINCIPAL CITIES

Millions of feet...

Millions of feet of Simplex wires and cables in service before the war are still doing good work on many vital war jobs. Every day they are proving the value of prewar Simplex quality. They should be kept in service as long as possible because of the scarcity of materials from which to make new cables.

Simplex cables, as now made, conform to government regulations prohibiting the use of natural rubber for commercial purposes. The "know how" built up through nearly sixty years devoted exclusively to the manufacture of insulated wires and cables has enabled us to develop synthetic insulations to pinch-hit for prohibited rubber compounds.

Unusual demands are being met, unusual service is being rendered, values are being discovered in new materials and plans are being made to apply war-time developments to postwar cable service. Simplex postwar wires and cables will be better than ever before.

Simplex wires and cables, for the duration, are war products subject to such restrictions as may be necessary to conserve strategic materials. Under modified specifications they are being made with the same skill and care that have been the basis of Simplex quality for so many years but they are available only for essential war work.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

Simplex

WIRES and CABLES

A 612 PAGE BOOK

Just published!

416 *BRIEFALOG

to wartime printing restrictions, the color of this book reproduced here is not strictly "on the beam" . . . It should be bright orange, blue a

PAGES from 307 MANUFACTURERS

The 1944 E-B-R Contains

MANUFACTURERS BRIEFALOG SECTION — The condensed catalogs of 307 manufacturers of electrical and allied products. In addition to vital information for planning, specifying and requisitioning, you will find listings of branch offices, warehouses, etc.

CLASSIFIED DIRECTORY OF MANUFACTURERS — Here for quick reference you will find company addresses and trade names, arranged by product. Extensive cross-references to help you find the electrical and allied products made by more than 3,500 manufacturers. Bold face listings are used throughout to indicate the pages where each manufacturer's product data is given.

ALPHABETICAL INDEX OF TRADE & COMPANY NAMES — Complete with addresses. Starting with only a trade name or a company name, you can thus quickly locate the product data you need.

NOTE: Distribution of E-B-R has no connection or relationship with subscriptions to any McGraw-Hill publication. Every year E-B-R is sent to approximately 30,000 large electrical contractors, electrical wholesalers, large industrial plants electric utilities, electrified railroads, mines, government services.

HERE'S WHY!

People who write in for copies of E-B-R are frequently surprised to learn that the distribution of the book has already been completed. "Why advertise it, then?", they sometimes say.

Here's why: Once we send out the book we want to be sure that the recipients are aware of the usefulness of the product data they have, and that they use it frequently. So we tell them our story regularly, through advertisements such as this one.

Electrical Buyers Reference
McGraw-Hill Publishing Co., Inc.
330 West 42nd Street, New York 18, N.Y.

★ **Briefalogs are the modern method of cataloging, with condensed descriptions and specifications on products, plus branch offices, distributor and warehouse addresses for quick follow through.**

The latest up-to-the-minute data at your fingertips!

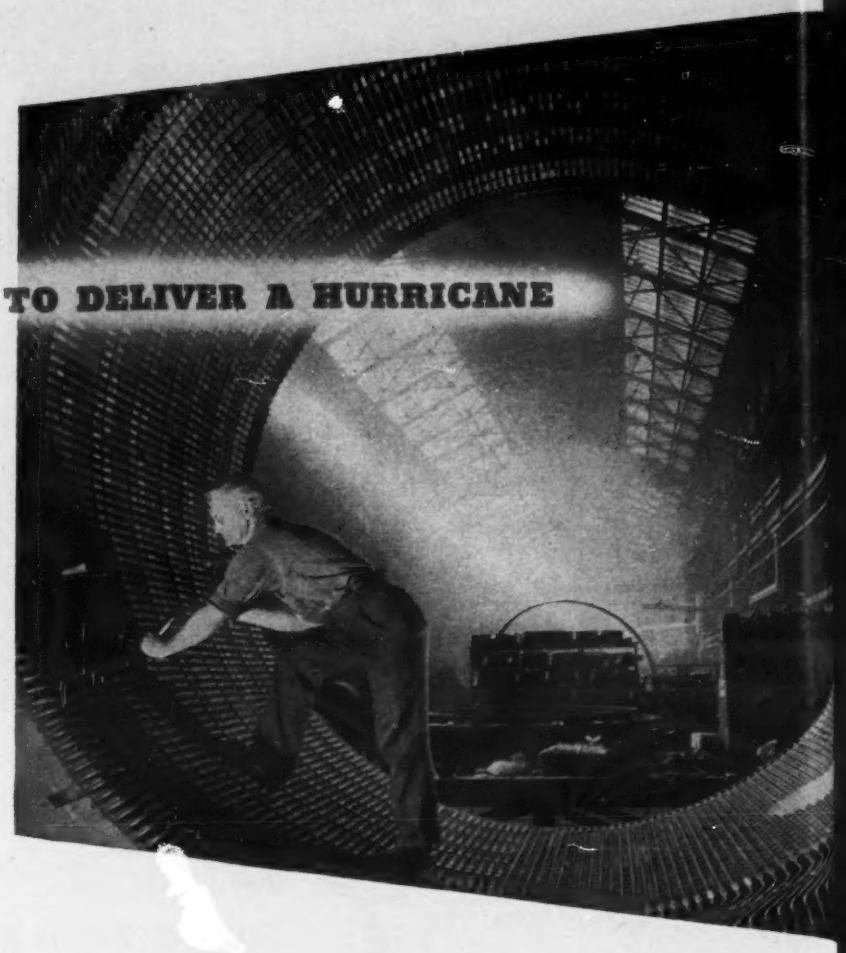
Things are happening so fast these days. . . product changes, new materials, etc. . . . even the most complete catalog file can be out of date.

Right now, when you're busiest, this new 1944 Electrical Buyers Reference can be *so useful!* Larger and with more product data than ever before in its history, it gives you a wealth of information that you need every day . . . all substantially and attractively bound in one volume.

You'll be surprised when you discover how much time you can save by referring *first* to the compact, comprehensive 1944 E-B-R. There just isn't *anywhere* else that you can get the latest product data of over *three hundred* manufacturers of electrical and allied products so quickly.

Put E-B-R to work the moment it lands on your desk. Keep it within arm's reach through '44. It will save you time and money!

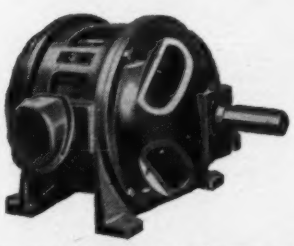
BUILDING A MOTOR TO DELIVER A HURRICANE



Driving a 400 mile-an-hour super-hurricane through a plane-testing tunnel takes plenty of horsepower . . . more than anybody had ever packed into a wound-rotor induction motor before. To do it, Westinghouse designed and built the world's largest. Its 40,000 horsepower spins two 16-blade fans standing nearly 40 feet high—weighing 197 tons. The motor itself weighs 125 tons, stands 15 feet high and you could drive a small truck through the stator you see above. Cooling it takes 85,000 cubic feet of air per minute.

This is just another example of Westi house ability to build motors—motors d signed to do specific jobs. It's the kind of en neering skill back of every Westinghou motor you buy—special or standard.

For war work or postwar reconversion, ta full advantage of this ready-to-use experienc You'll solve your drive problem quicker an know the motor will fit the job—whether is a fractional or 40,000 horsepower. Westin house Electric & Manufacturing Compan East Pittsburgh, Pa. J-21



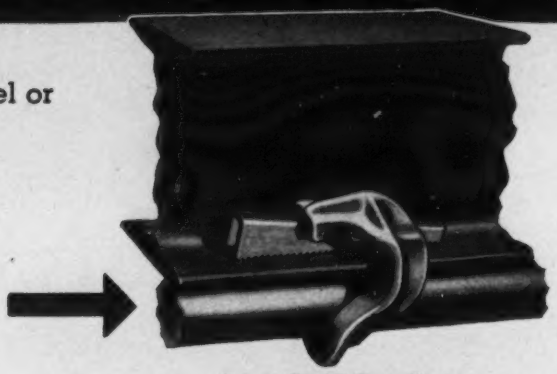
This is only one of the many Westinghouse general purpose motors available in standard and special enclosures. Features include choice of sealed sleeve or ball bearings; Tuffernell insulation; Balanced rotor; rigid one-piece frame; die-cast rotor; radio-frequency tested insulation.

Westinghouse Motors

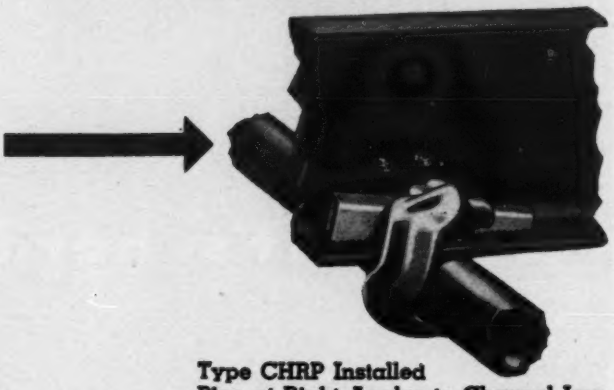
PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

CROUSE-HINDS
NEW Dual-Purpose
Type CHRP *Wedgtite* Pipe Hangers

- **Hangs pipe either way.** Parallel or at right angles to structural support.



Type CHRP Installed Pipe Parallel With I-beam

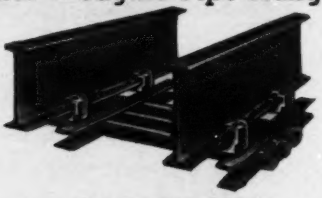


Type CHRP Installed Pipe at Right Angles to Channel Iron

- **Simple.** Only 2 parts, a hook and a wedge.
- **Easily installed.** A few blows of a hammer.
- **Malleable iron hook.**
- **Hardened steel saw-tooth wedge** bites into flange, making a tight, vibration-proof grip.
- **Adaptable.** Sizes for ½ to 2-inch pipe. Can be used on any I-beam, channel iron, or other structural shape having a flange ⅛ to 1⅛ inch thick.

***Wedgtite* pipe hangers can be used for electrical conduit, water pipes, steam pipes and sprinkler systems.**

Other *Wedgtite* Pipe Hangers.



Type CHU Installed Pipe Suspended from a Structural Support

Type CHB for Pipes Parallel or at Any Angle with Structural Support

A Nationwide Distribution Through Electrical Wholesalers

Wedgtite Hangers are listed in Condulet Catalog No. 2500, Section 70, Pages 3 and 4. Type CHRP Wedgtite Hangers replace both type CHR and type CHP.

CROUSE-HINDS COMPANY
SYRACUSE, N. Y., U.S.A.

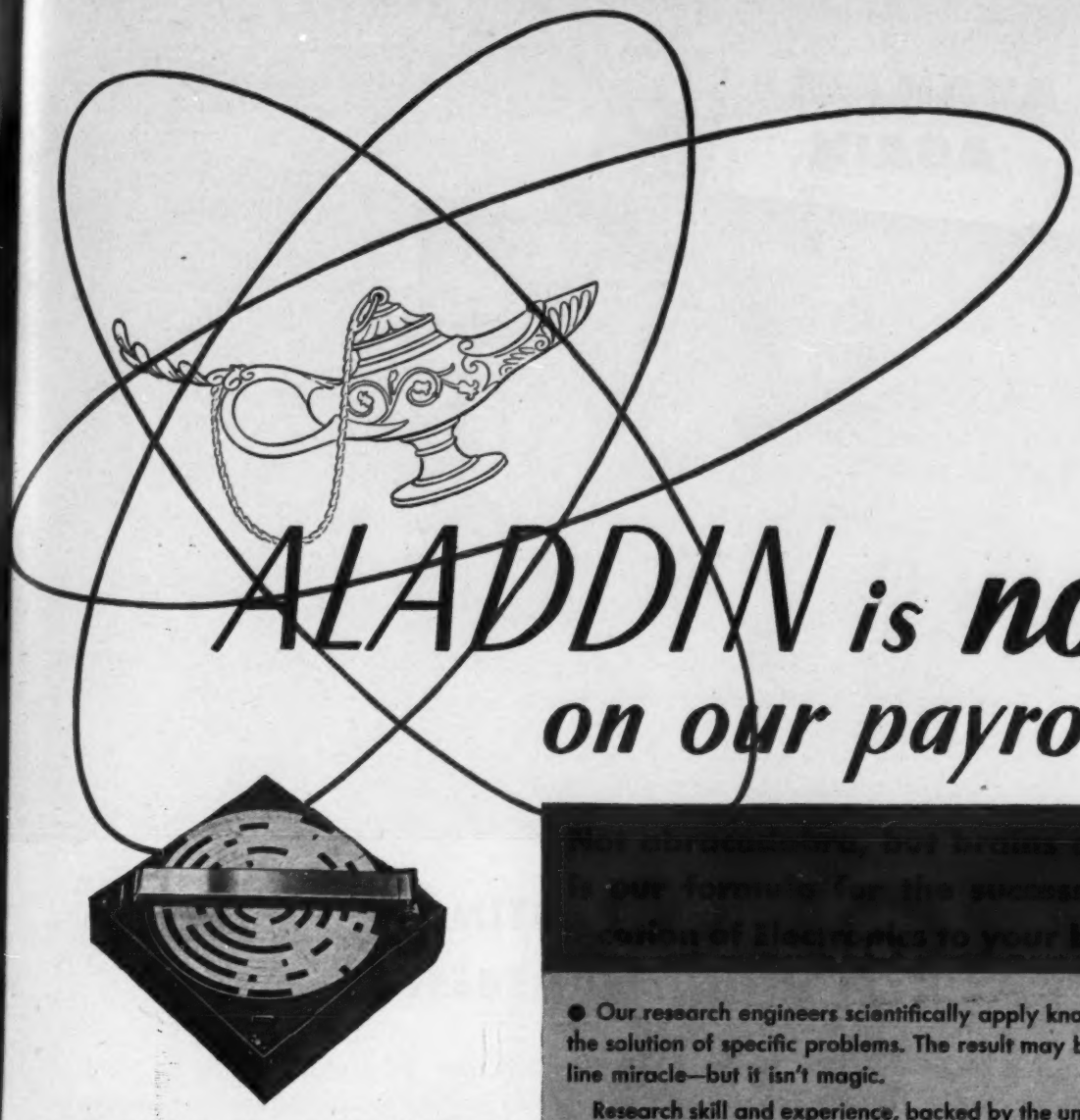
Offices: Birmingham · Boston · Chicago · Cincinnati · Cleveland · Dallas · Denver · Detroit · Houston · Indianapolis · Kansas City · Los Angeles · Milwaukee · Minneapolis · New York · Philadelphia · Pittsburgh · San Francisco · Seattle · St. Louis · Washington
Resident Product Engineers: Albany · Atlanta · Charlotte · New Orleans

CROUSE HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

THIS is about a little experiment we performed with a 40 gauge Chromel-A wire, which is not much coarser than the hair of your head. We wanted to find out what would happen to a wire so fine, if it would be heated to 1800 Deg. F., say, by passing a current through it. . . . If you didn't know how durable Chromel-A is as a heating element, you'd think that this .0031" dia. test wire, so treated, would just about vanish, while you watched. Actually, however, this 40 gauge Chromel-A wire, just suspended as a loop, has now run for 888 hrs. at 1800 Deg. F. How much longer it will last, we don't know. It's already lasted long enough to prove the tough durability of Chromel-A, in the heavier sizes used in the heating devices you sell as a dealer, or as a maker. It likewise proves the lasting quality of Chromel-A in electric ranges and industrial units.

HOSKINS MANUFACTURING CO., DETROIT 8, MICHIGAN

Chromel
NICKEL CHROMIUM
HOSKINS
CHROMEL
ELECTRICAL HEATING ELEMENT
WIRE



ALADDIN is not on our payroll >>>

AUTOMATIC PROCESS CONTROL

This new development by the research laboratories of General Electronics Industries provides automatic control of chemical processes and also of production machinery, by means of printed charts which may be replaced or interchanged as readily as phonograph records.

Other products manufactured include:

ELECTRONIC CONTROLS • VACUUM TUBES
HYDRAULIC SERVOS • COMMERCIAL RADIO EQUIPMENT
ELECTROSTATIC HEATING UNITS UP TO 250 KW.
ELECTROMECHANICAL DEVICES

● Our research engineers scientifically apply known principles to the solution of specific problems. The result may be a production-line miracle—but it isn't magic.

Research skill and experience, backed by the unsurpassed facilities of one of the largest organizations specializing in Electronics, and coupled with expert service at all times, are what we have to offer. Nothing awesome, mind you, but practical, scientific know-how and sound business practice that get results.

If this sane, "feet-on-the-ground" service is the kind of help you want on your postwar production planning, why not write: Engineering Department, General Electronics Industries, 342 West Putnam Avenue, Greenwich, Connecticut.

ARMY-NAVY "E" WITH STAR awarded to Auto-Ordnance Corporation for continued excellence in production of "Tommy" Guns.

GENERAL Electronics INDUSTRIES

Division of Auto-Ordnance Corporation

GREENWICH • STAMFORD • BRIDGEPORT • NEW MILFORD • NEW YORK

HERE'S THE *IDEAL* MOUNTING MATERIAL

K&M EBONIZED ASBESTOS

With expanded production facilities K&M can again supply you with Ebonized Asbestos—the *superior* mounting for such installations as switchboards, panels, bus bar supports and testing tables.

K&M Ebonized Asbestos is a carefully worked-out combination of asbestos fibre, binding cement and insulating compound pressure-molded into monolithic sheets . . . It's *strong*—will withstand severe shock, vibration, rapid temperature changes. Its dielectric strength is unusually *high* —a sheet as thin as ¼" can be subjected to approximately 20,000 volts without puncture. It's *lasting*—actually grows tougher with age—won't shrink, crack or bulge.

Previously, our entire production of Ebonized Asbestos went for essential wartime installations. K&M can *now* supply you with Ebonized Asbestos in ⅛-inch to 4-inch thicknesses—in "standard" or special "panel" finish.

K&M Ebonized Asbestos has been specially developed to meet the technical requirements of the Underwriters Laboratories, Inc., when built into an assembled unit.

★ ★ ★

Nature made asbestos:
Keasbey & Mattison, America's asbestos pioneer, has made it serve mankind . . . since 1873

KEASBEY & MATTISON

COMPANY, AMBLER, PENNSYLVANIA

★ Our Ambler plants proudly fly the Army-Navy "E" flag—an honor awarded K&M employees "for outstanding production of war materials."

Save Installation Labor

by specifying G & W Type "FC" Cutouts on your transformers

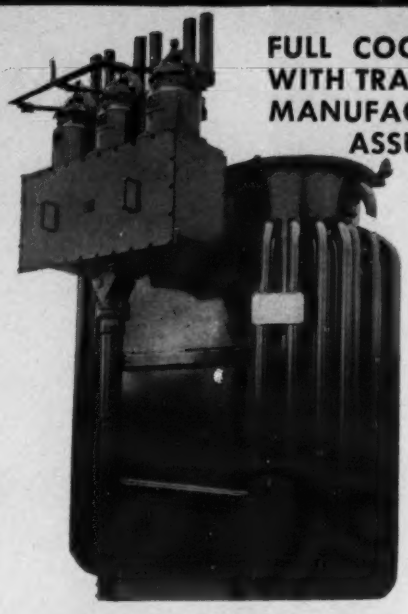
STYLE "B"
With gasketed flange for mounting on boxes.

The years of trouble-free service has created a wide acceptance of G & W Type "FC" Oil Fuse Cutouts. The modern design provides interchangeability of parts for various installation conditions. The interlocking cover and cover clamp insures safety in fuse replacement. The simple and inexpensive fuse link universally fits all Type "FC" cutouts.

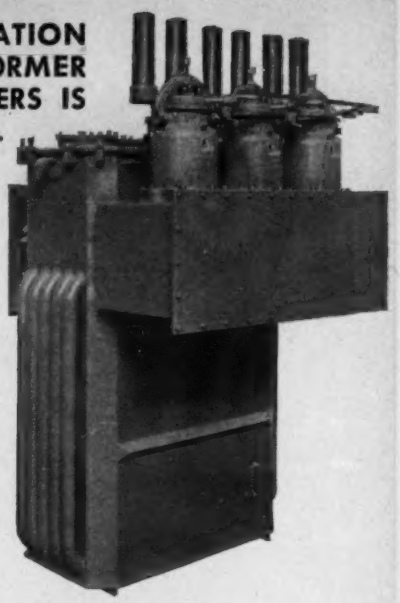
½ cycle interruption of short circuits protects equipment.

Beryllium copper springs make ideal full load break switching contacts.

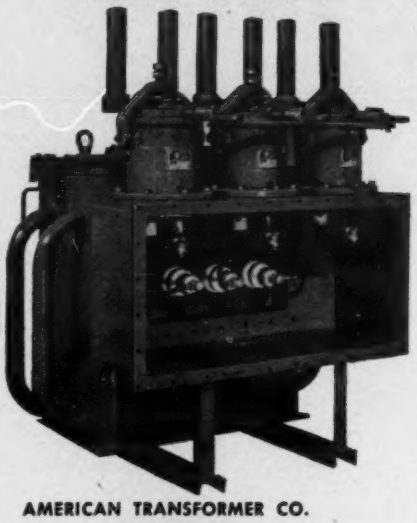
FULL COOPERATION WITH TRANSFORMER MANUFACTURERS IS ASSURED.



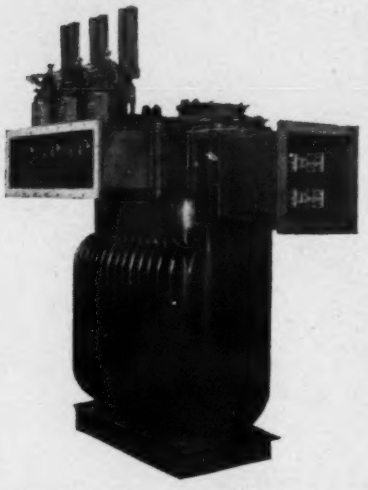
MOLONEY ELECTRIC CO.



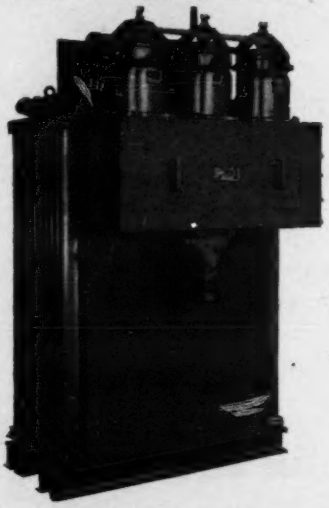
WAGNER ELECTRIC CORP.



AMERICAN TRANSFORMER CO.



PENNSYLVANIA TRANSFORMER CO.



"NIAGARA" ERIE ELECTRIC CO.

Secure the advantages of complete unit metal enclosed construction with CUT-OUT BOX attached to the transformer.

Installation labor is reduced by merely terminating the feed cables in potheads *(also made by G & W)* or within the cut-out insulators inside of the box. Conduit connections can be made on the pothead or directly on the box.

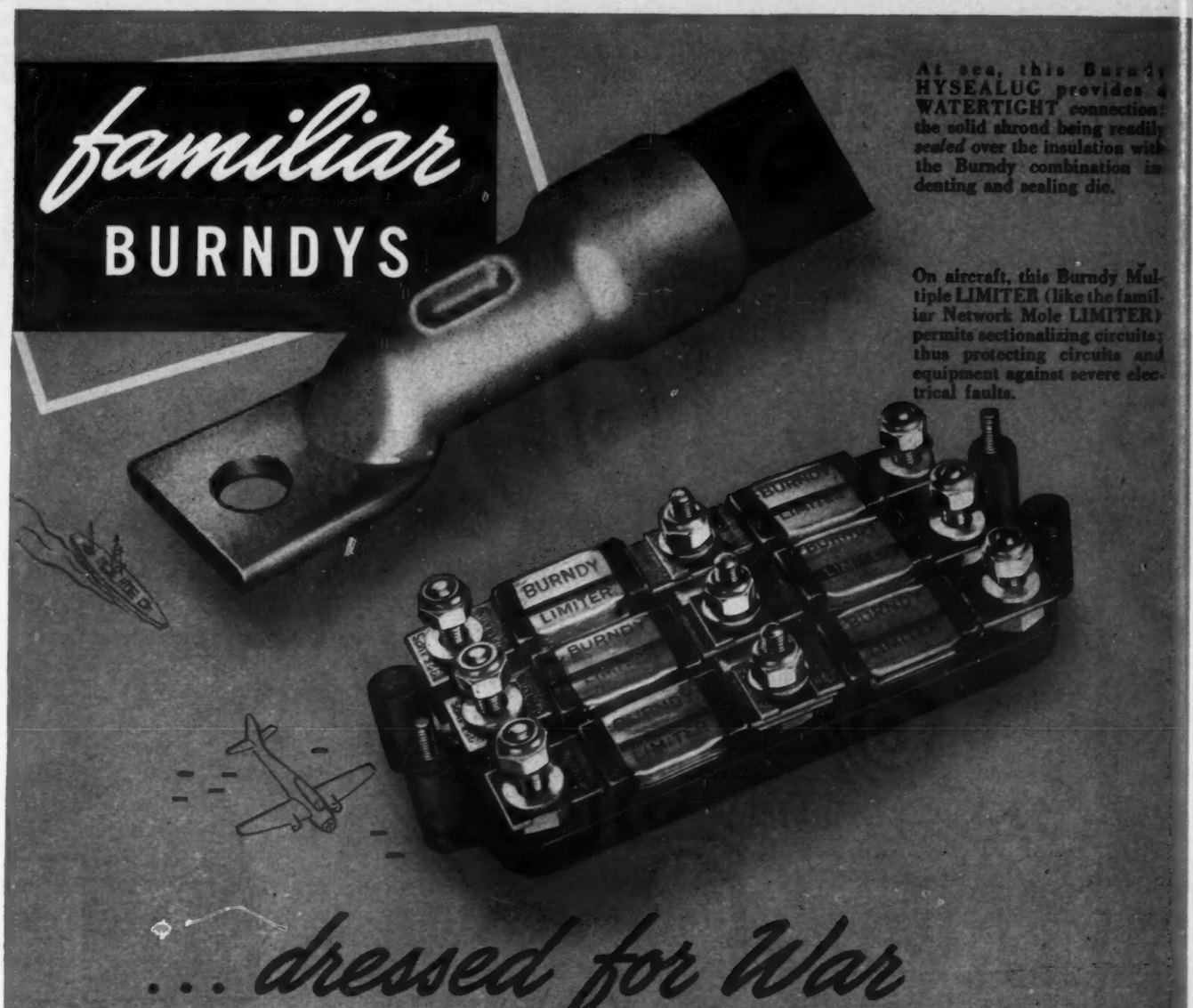
An economical primary load-break oil switch with overload and short circuit fuse protection.

Send for Bulletin No. 425

G&W ELECTRIC SPECIALTY CO.
Dependable Cable Accessories
7780 DANTE AVE., CHICAGO 19, ILL.
Also made in Canada by Powerlite Devices, Ltd., Toronto

GANG OPERATED

FOR FUSING AND SWITCHING PRIMARY CIRCUITS SUBWAY – OVERHEAD – VAULTS


familiar
BURNDYS
At sea, this Burndy HYSEALUG provides a WATERTIGHT connection: the solid shroud being readily *sealed* over the insulation with the Burndy combination indenting and sealing die.
On aircraft, this Burndy Multiple LIMITER (like the familiar Network Mole LIMITER) permits sectionalizing circuits; thus protecting circuits and equipment against severe electrical faults.
BURNDY
LIMITER

. . . dressed for War

To the utility industry, America owes much for the outstanding efficiency of its electrified fighting equipment. Basic utility designs for networks and electrical components are in evidence everywhere . . . a tribute to the engineering skill and foresight of the utility engineer.

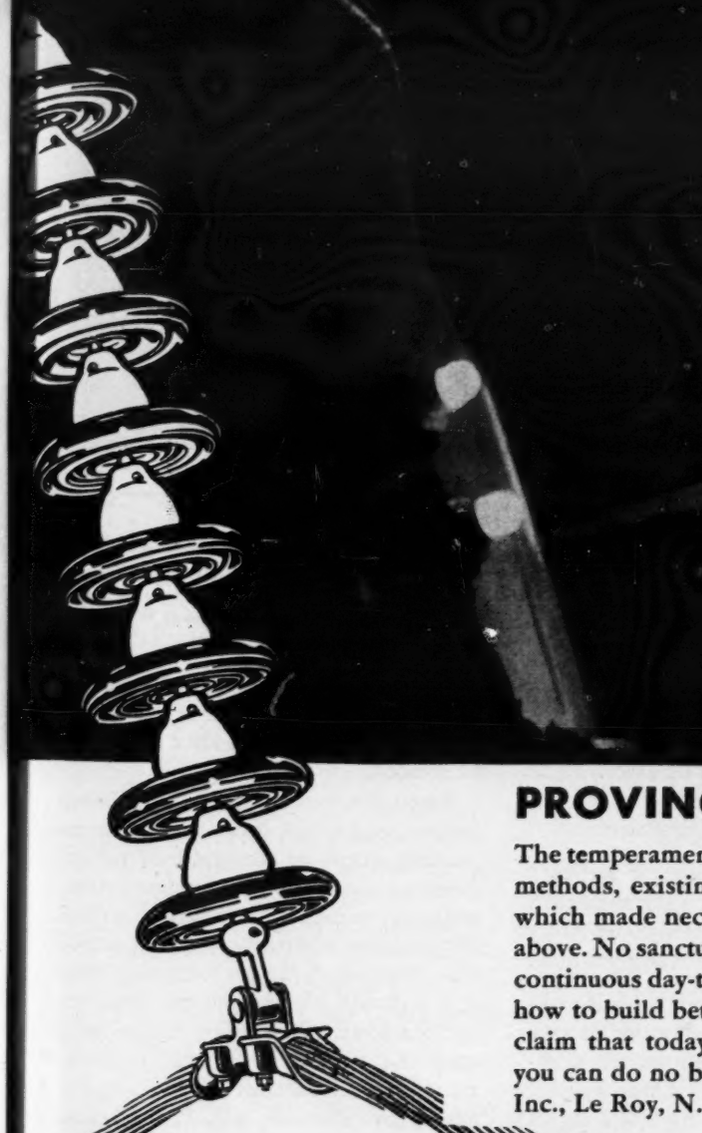
Even for connectors, Burndy has leaned heavily on its *utility background* in designing efficient connectors to meet all the arduous requirements of this mechanized war.

Headquarters for CONNECTORS

Burndy

BURNDY ENGINEERING CO., INC.
107 EASTERN BOULEVARD, NEW YORK 54, N. Y.
IN CANADA: *Canadian Line Materials Limited, Toronto 13*

T'S THE *PORCELAIN* THAT INSULATES



PROVING GROUND FOR INSULATORS .

The temperament of the Lapp organization is that of dissatisfaction with existin methods, existing designs. It is this spirit which produced the Line Post an which made necessary the Lapp laboratory, a corner of which is photographe above. No sanctum sanctorum, this laboratory is truly an engineers' workshop, i continuous day-to-day use, testing, discarding, proving new designs. As we lea how to build better insulators, we build them. Meanwhile, we feel secure in ou claim that today's Lapp insulators are adequately suited to today's needs, th you can do no better than to insulate your lines with Lapp. Lapp Insulator Co Inc., Le Roy, N. Y.

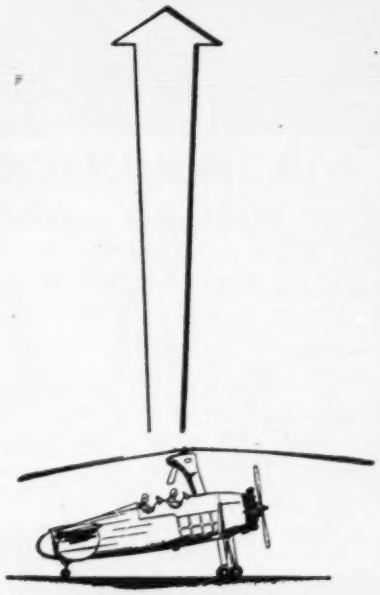
ARMY E NAVY

Lapp

Better Porcelain • Better Insulators

One of an earlier fleet of Kelletts, developed in cooperation with the United States Army Air Forces.

15 YEARS OF ROTARY WING PIONEERING



A Kellett takes off vertically, lands practically anywhere. Air speeds—from practically 0 to 120 MPH.

1944 marks the fifteenth year during which Kellett has been producing rotary wing aircraft. Each year the path of progress in this branch of aeronautical science has been extended by additional Kellett in-the-air accomplishments.

All wartime production of Kellett's advanced types of rotary wing ships is in cooperation with the United States Army Air Forces—details may not be given now.

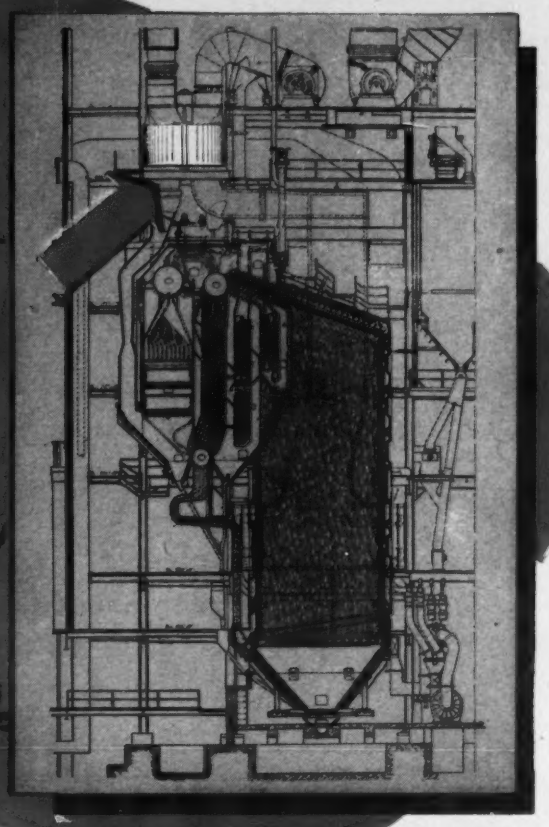
But among many, even *pre*-war indicators of postwar opportunities to save time and cut costs for industry, commerce and agriculture, is this historic Kellett record: completing 2,607 flights in a single year, on a daily timetable, between airport and the Philadelphia post office roof, month after month, in all seasons.

When the war has been won, Kellett looks ahead to opportunities for its expanding corps of forward-looking engineers to apply their accumulated rotary wing experience to producing aircraft for patrolling electric power lines and oil pipe lines, spraying and dusting crops and orchards, oil and mineral prospecting, forestry fire prevention, transporting mail and passengers directly to urban centers. Kellett Aircraft Corporation, Upper Darby (Philadelphia), Pennsylvania.

KELLETT

OLDEST ROTARY WING AIRCRAFT MANUFACTURING COMPANY

MORE FIGHTING POWER *BEGINS HERE*



Ljungstrom-equipped steam plants help meet power needs of America's No. 1 war-production area

THREE of these modern steam generating units, each rated at 440,000 lb. steam per hr., are now helping to meet vital power requirements of the Detroit area. Efficiency of powdered-coal firing is increased by preheated combustion air. Exit gas enters the Ljungstrom Preheaters at 780°, leaves at 353°, raising air temperature to 598 degrees.

• • • • •

Back of the bombers, back of the tanks and trucks and artillery now pouring out of our great production centers, is the "mechanical muscle" to build them — the power supplied by steam generating plants like these.

In the majority of cases, the largest, newest and most efficient boiler plants are equipped with Ljungstrom Air Preheaters. Three simple reasons explain why:

1. *Ljungstrom Air Preheaters save more fuel.* They increase the economic limit of heat recovery, improve the combustion conditions, and permit efficient firing of poorer coals.

2. *Ljungstrom Air Preheaters save steel.* The continuous regenerative counterflow principle results in ⅓ to ½ greater heat transfer per unit weight of heat-transfer surface. A lighter, more compact unit also saves steel in the supporting structure.

3. *Ljungstrom Air Preheaters sustain "high availability" records.* Operating records in many power plants show they are capable of long, continuous service under severe conditions, without interruption.

Application of Ljungstrom Air Preheaters is not limited to steam generating plants; they are being applied for heat recovery on oil heating furnaces, metallurgical furnaces and the like, where gas-to-air heat transfer is required. For complete information or engineering aid, write:

THE

AIR PREHEATER

CORPORATION

Executive Offices: 60 East 42nd Street, New York, N. Y. • Plant: Wellsville, New York

THE SEARCH THAT NEVER ENDS

IN THE industrial life of America, research has been of constantly increasing importance. And today it is a national resource, for the research of industrial and college laboratories is proving its value in War.

To the Bell System, research is an old idea, for the telephone itself was born in a laboratory. Behind its invention, sixty-nine years ago, were researches in electricity and acoustics and in speech and hearing.

And, ever since, there has been a laboratory where scientists have searched to know more about these subjects; and with their associated engineers have applied the new knowledge, fitting it with all the old, to make the telephone better and better.

Their fields of inquiry have broadened and deepened through these years; they inquire into all the sciences and engineering arts which have any promise of improving the telephone. Much has been learned but still more will be, because their search goes on. That is why the telephone laboratory grew to be Bell Telephone Laboratories, Incorporated, the largest industrial laboratory in the world. And it exists to improve telephone service.

Improvements in industry can be left to chance in the hope that some one, sometime, will think of something useful; that some good invention will turn up.

The other way to make improvements is to organize so that new knowledge shall always be coming from researches in the fundamental sciences and engineering arts on which the business is based. From that steady stream will arise inventions and new methods, new materials and improved products.

This is the way of Bell Laboratories. Its search will never end. And as fast as it can the Laboratories will apply its new knowledge practically to the design of equipment and communication systems.

At present—and this started before Pearl Harbor—its trained scientists and engineers and all their skilled associates are concentrating on products of importance to our armed forces. But when this work is happily over they will be ready to continue their developments for the needs of peace.

BELL TELEPHONE SYSTEM

"Research is an effort of the mind to comprehend relationships no one has previously known; and it is practical as well as theoretical." . . . . . *BELL TELEPHONE LABORATORIES*

1933-1943

10 YEARS OF WAR ON LIGHTNING OUTAGES

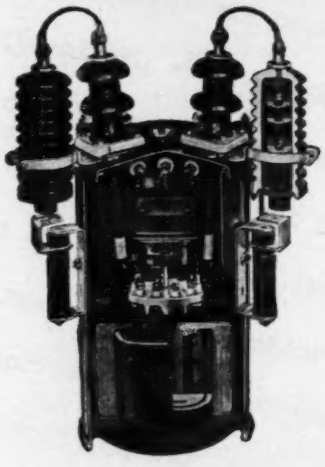
...WON BY CSP TRANSFORMERS!

Lightning, ten years ago, caused nearly all distribution system outages. In 1933, for the first time, this destructive force met its match—the CSP Transformer designed by Westinghouse.

In the CSP Transformer, 3-Point Protection and "De-ion" Gaps tame lightning. They were the first protective devices to provide adequate surge-current capacity to handle *direct* lightning strokes.

The "De-ion" Gap provides an ionized path of low resistance, established each time a flashover occurs. Coupled with 3-Point Protection, it positively eliminates lightning damage to transformer windings.

The operating record of 343,000 CSP Transformers now in service shows conclusively that damage from lightning, short circuits and dangerous overloads has been effectively eliminated. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-70424



Completely Self-Protecting

- **against Lightning**
- **against Burnouts from Short Circuits**
- **against Burnouts from Overloads**

Westinghouse

PLANTS IN 25 CITIES . . OFFICES EVERYWHERE

DISTRIBUTION TRANSFORMERS

THE KERITE INSULATED WIRE & CABLE COMPANY INC

SOLE MANUFACTURERS OF KERITE INSULATED WIRES AND CABLES

GENERAL OFFICES
30 CHURCH STREET
NEW YORK-7-N.Y.

OFFICE OF THE PRESIDENT

NEW YORK
January 1, 1944

To Kerite Users:

Kerite insulation is now being manufactured with GR-S in place of rubber in accordance with orders of the War Production Board.

The electrical characteristics of the insulation as now manufactured are essentially the same as those of the material which you have previously used. Therefore, it is not necessary to make any changes in our published data or to alter in any way our recommendations as to carrying capacity, voltage rating, test voltage, minimum insulation resistance, etc.

Kerite insulation containing either rubber or GR-S does not require the protection of a sheath against sunlight or moisture. Kerite, the principal and controlling constituent of our insulation, is unchanged.

H. V. Harris
President.

Reconversion *and* Contract Termination

AMERICAN industry is dedicated to an all-out effort to achieve victory, and its good faith in this direction is amply demonstrated by the results.

American industry also is dedicated to making democracy work effectively after the victory. And it is toward this objective that industry must prepare itself to guide the processes of demobilization and reconversion in order to minimize the dislocations and chaos which too easily can result from so tremendous a task.

We exercised foresight from the very beginning of the war mobilization program. Let us now exercise foresight in the approaching changeover from a wartime to a peacetime economy.

The first step in converting American industry from military to civilian production is the termination of contracts between the government procurement agencies and the producers. There are now in force war contracts amounting to tens upon tens of billions of dollars. As the demand for weapons of war decreases, the Armed Services will undertake to cancel contracts. With the emphasis shifting from weapons of one category to weapons of another category, many billion dollars worth of contracts already have been terminated. It is hoped that the experience now being gained in this work will provide the basis for effective and sound procedures when an avalanche of cancellations comes later.

Many complex problems involved in the termination of contracts will materially influence the success of the entire reconversion program. Once war demands fall off sufficiently to permit the renewal of civilian production, we will have to act with great speed if we are to avoid large-scale unemployment. Prompt financial settlements of contracts and the rapid clearance of plants are of immediate and great significance. In many cases the removal of equipment and raw materials will be more important than money payments. The allocation of raw material for civilian production will be of paramount importance.

Government agencies obviously must exercise great care in spending the people's money and in protecting the interest of the public against excessive payments. Unjust enrichment at the expense of the people will not be condoned nor will it reflect favorably upon management to present inflated claims. But long-delayed negotiations, which will retard the initiation of civilian production, likewise must be avoided.

The contracting agencies and the manufacturers both know that the greatest losses in the reconversion period will result from delays in getting peacetime production under way. The

greatest potential wastes lie in unemployment and in idle plants. The magnitude of such losses to the public can be far greater than the money spent in liberal settlements; to the manufacturer, these losses can represent vastly more than the extra funds that might result from interminable litigation. Policies must be firmly established *now* whereby the manufacturers, including subcontractors and suppliers, will receive substantial settlements immediately in order that ample funds be available for reconverting plants and accumulating necessary inventories of peacetime goods. Nor must we overlook the fact that the uncertainty of long drawn-out disputes will have a stifling effect on enterprise and that final settlements, therefore, should be made as promptly as possible.

Plants that are equipped largely with special wartime tools and machines and that are fully stocked with materials, components, and finished military products will not be able to undertake any substantial degree of conversion until this machinery and this inventory are removed. Advance arrangements are essential for the prompt clearance of great numbers of plants the country over. Adequate warehousing facilities must readily be available so that the changeover to civilian production will not be hampered.

As war demands decline, civilian output will be resumed; and while we recognize that the demands for munitions must vary as the strategy of the military leaders is changed, it is hoped that the Armed Services already have or soon will develop schedules of their continued needs under different strategic assumptions. If we know in advance the probable curtailment in war requirements we are in position to estimate the timing and the quantities of raw materials, the number of workers, and the industrial facilities which will be available for peacetime purposes. It will then be possible to integrate the lifting of restrictions on civilian production with the drop in war production.

Needless unemployment and idle plants will prevail if restrictions on the output of civilian goods are removed at a slower rate than available manpower, materials and plants permit. On the other hand, if the controls on civilian production are removed prematurely or too freely, then the production of military requirements will be hampered correspondingly. There will be great clamor and pressure for eliminating all restrictions as soon as any measurable quantity of materials and numbers of workers are freed from war work. It will react adversely on industry as well as on government if these pressures are heeded indiscriminately, thereby retarding the production of munitions for our boys who still will be fighting and dying at the front. The coordination of declining war demands with increasing civilian production probably is the most difficult and at the same time the most important task in our entire reconversion problem. Advance planning and sound judgment are essential.

An order of priority for initiating non-war or civilian production must be prepared beforehand. The schedule of resumption of peacetime production should be governed by the amounts of

materials, manpower and facilities that are available as well as by the relative needs or importance of different products. There will be strong competition for priority among the various kinds of consumer goods, equipment needed for reconversion, producers goods required for expansion and modernization, and export demands. Relative need obviously is the most compelling criterion. But because of the importance of expediting reconversion, earliest consideration is urged for the tools and fixtures and models which will expedite large-scale civilian production when adequate labor and materials are available. In any case, advance schedules will be needed to avoid a makeshift, piecemeal lifting of controls on the basis of who shouts the loudest.

Another difficult problem of the reconversion period will be to keep to a minimum the distortion of inter-industrial and intra-industrial relationships. Many varieties of consumers goods compete for the consumer dollar, and some industries will offer strong resistance if the green light is given first to industries whose products may thereby acquire a time advantage.

Even more difficult will be the matter of competition between companies producing the same products. Some manufacturers may find themselves tied up with continuing war contracts with restrictions on their peacetime products suddenly lifted and their competitors free to take advantage of the situation. The declining need for different kinds of war materiel will vary greatly, and some producers inevitably will be available for peacetime production considerably in advance of some of their competitors.

This raises the question of victory models or nucleus plants to eliminate competitive advantages among producers of identical products pending the time when all are on an equal footing again. Policies controlling this should take into account the degree or the extent of competitive advantage which reconversion might bring, and also upon the time interval during which these advantages will prevail. Such programs necessarily mean increased government control, hence they should be adopted only under the most pressing circumstances.

There is the important question of termination as between large and small plants. Fairness must be exercised, and undue advantage to either group must be avoided in extending opportunities to continue receiving profitable war orders or in getting back into civilian production. The problems of small manufacturers must not be neglected in this period. Likewise, any restraints on new ventures and on more vigorous competition must meticulously be avoided.

There also is the question of communities which have been greatly enlarged and others which actually have been brought into being by the war. It might be advisable to terminate contracts in these areas first in order that the workers might be encouraged to migrate elsewhere while employment prospects are most favorable. Also, if continued production of some armaments is contemplated after the war, it might be well to concentrate this production in communities which otherwise would be stranded.

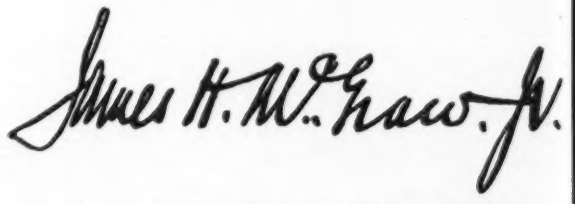
If the process of terminating contracts is to be geared into meeting continued demands for munitions and also expediting reconversion, then the Armed Services must accept broad policy considerations as criteria for cancelling contracts. Procurement officers might be inclined to cancel contracts with all high cost producers first. Or they might be inclined to cancel small producers first so as to reduce the administrative burden. Then again, they might cancel the newer producers of specific products rather than the older, time-tried manufacturers.

These procurement criteria may all be highly desirable and efficient but other important considerations such as those mentioned above must be given proper attention. ***Demobilization cannot be a separate process from reconversion.*** They must be united. The termination of contracts is a demobilization task, but I am confident that the procurement agencies appreciate the importance of this operation in facilitating reconversion and that they will take full cognizance of the policies necessary for giving every assistance to initiating peacetime production.

I have not attempted to raise all the important policy questions in terminating contracts, nor do I propose specific solutions for each major problem. Rather it has been my purpose to indicate the complexities of the task which faces us and to urge that intelligent and sound plans be developed now while there is time. By so doing, we can avoid the dislocations and economic disorder which otherwise might characterize the reconversion period. The better we are prepared, the more rapid will be the resumption of full employment and good business after the war is won.

This job of changing America's industrial pattern from war to peace speedily and efficiently, is one which will tax the talents and knowledge of the ablest business men of the country. These men can, and I am sure that they will, attack this task with the same energy and determination that characterized their efforts in the period of mobilization for war.

Industry advisory committees were established to cooperate with governmental agencies in the great task of conversion to a full war economy. These committees are the means through which industry has the opportunity to play a major role in the solution of the problems of reconversion. It must assume that responsibility or accept the consequences in the form of enforced government control. Industry must take a renewed interest in these committees and make certain that our best minds and strongest men are available for the challenging job of conversion which we face now. It is a job that must be done well if we are to have a good start on the road to a greater democratic and free enterprise nation.



President, McGraw Hill Publishing Company, Inc.

A Year of Promise

The new year is only a single week old, yet it already has made news, and before it is over it will have become a famous period in history. Somewhere within its twelve months the guns will cease firing in one sector of this mighty world war and, who knows, maybe in the other.

For mankind everywhere 1944 will be a year of liberation—a year in which living can start once more and plans for happiness be made. For business 1944 will also be a year of liberation—a year in which free markets again appear. Not all restraints will be removed, but enough to make the task of restoration one of incentive.

For the electrical industry in particular the transition from war to peace will have fewer headaches than other industries because so much of it never converted to a different kind of production. Its war effort lay largely in doing more of what it had been doing. For that reason this industry can switch back to the service of its normal customers without so much overhauling of its physical structure.

However, like all business, the electrical industry has to get back to its customers, and it isn't going to be easy. It has to learn once more how to sell, how to promote, how to compete. Maybe to some this doesn't seem like any problem at the moment, but how many good salesmen are left in their old jobs? How many suppliers know their customers as they once did? Or what their needs are?

This year of transition from war to peace will pose some very important decisions, but none more important than the choice of roads, one of which at the fork is marked "The way we did it before the war" and the other "The new way."

The two-year suspension of ordinary business has given industry the opportunity to start afresh, without employing some of the pre-war methods and practices that were not of the best. If industry lapses back into pre-war ways of doing things without making a separation of the good and the bad, it will have lost a real opportunity.

In 1944 we must start laying the foundation of the structure for which we have been doing all of our post-war planning. It will be easy to forget this in the busy times of getting back to our old customers and filling the pent-up demand created by war restrictions, but we must remember that the real prosperity of this country is not in the next two years but in the next decade. That is why the decisions made in 1944 are so important.

While for some the transition to peace may be accompanied by what at the moment looks like an over-sold market, the prospects for the next decade in the electrical industry are imposing, reaching heights beyond those of wartime demand, for the whole economy of this country is based upon more power behind the worker, which means more of the output of every part of the electrical industry.

And so we salute the new year—the year of promised victory—the year that will usher in the greatest decade that this industry has ever known.

Bulk Power Metering Useful for Power Pool Operation

Continuous and complete information of operating conditions has demonstrated value of telemetered demands and tie-line loading toward most advantageous use of generation and interconnection facilities

MORRIS D. HOOVEN, Public Service Electric & Gas Company, Newark, N. J.*

CONTINUOUS and complete information concerning immediately existing operating conditions is an extremely useful aid in getting the most out of a system's generating facilities. The load dispatcher who has at his fingertips exact up-to-the-minute data is equipped to function capably in maintaining continuity of service and efficiency of operation, a job of particular importance in wartime. Totalized loads, area loads and peak demands, by means of permanent records, are necessary for effective system planning.

In providing its million-kilowatt system (Fig. 1), which serves the New Jersey war load area and which is in turn one portion of the three million - kilowatt Pennsylvania - New Jersey interconnection, with such metering facilities Public Service Electric & Gas Company has recently added to existing facilities metering equipment which helps materially in fulfilling the desired requirements. This work was done in connection with the recent installation of new generating capacity at two locations in the system.

Objectives and results obtained from the recent installation of the impulse-duration (Metameter) system of telemetering installed to supplement the existing facilities may be cited briefly as follows:

1. Program of totalizing and telemetering of system loads was initiated in late 1920's.

2. Progress in communication channels and in telemeter art warranted expansion of metering facilities which was dictated by demand

*Electrical Engineer, Electric Engineering Department.

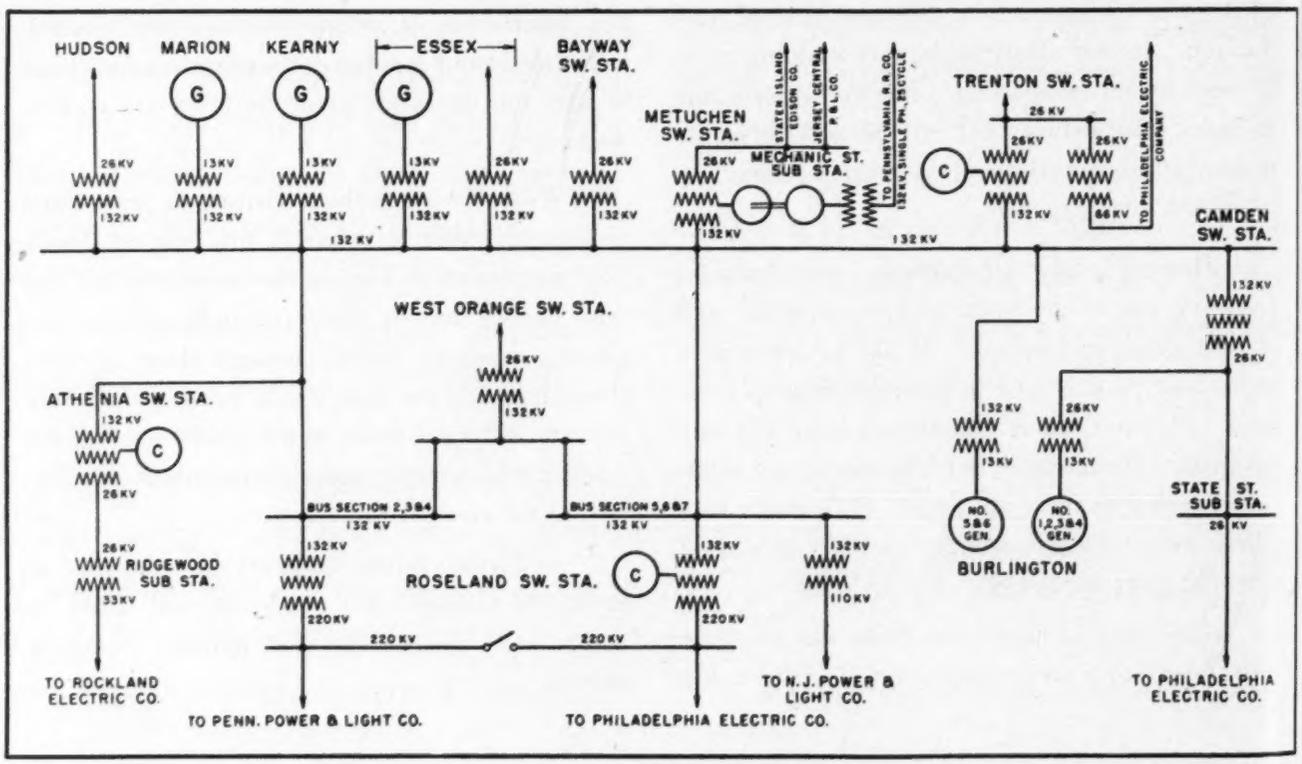


FIG. 1—Schematic system diagram shows a 132-kv. backbone, four generating stations, nine points of interconnection and numerous substations, all presenting a telemetering problem

for full wartime utilization of system capacity.

3. Changing system conditions—either as to supply or demand—requires reliable, accurate, complete and up-to-the-minute information from all significant points on the system.

4. Instant information is indispensable in emergencies when delays of a few minutes or even seconds could result in serious damage to irreplaceable equipment.

5. Automatically recorded information obtained for major system subdivisions by totalizing and telemetering is most valuable in analyzing operating disturbances and also in solving system engineering problems.

6. Tie lines have been more heavily loaded and scheduling of generating capacity more closely controlled as a result of enlarged facilities for telemetering.

Evolution of Program

On entering into full operation of the 132-kv. transmission system in the late 1920's, and subsequently into operation of the 220-kv. interconnection system, a program of installation of load-recording equipment was adopted. At generating stations and at switching stations serving large areas, at points on the 26-kv. transmission system where bulk power flow existed and at interconnection points meters were installed which when properly combined or interpreted would read area loads in terms of kilowatts or kilovars. Totalizing meters were installed at the generating stations (Fig. 2) and when the load dispatching facilities were centralized in Newark for the northern zone of operation kilowatt telemetering was installed to bring the totalized loads to the load-dispatching office (Fig. 3).

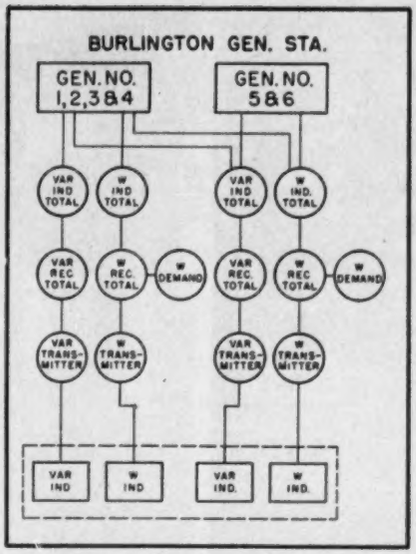


FIG. 2—At Burlington generating station generators 1-4 feed into the 26-kv. transmission system; generators 5 and 6 feed into the 132-kv. system; the two groups are separately totalized and telemetered to load-dispatching office; bus voltages as well as megawatts and megavars are transmitted

As new meters were added and new communication facilities installed the system and load area determinations became more accurate and the system operation and load-dispatching problems were presented in such fashion as to receive more intelligent handling. With the growth of load and system capacity and with the comparatively recent heavy use of system capacity required by wartime loads, the necessity of good metering and control methods became even more self-evident. The years of experience in operating the system with proper and accurate picture of the amounts of generating capacity available and the geographical distribution of load requirements have been productive of very favorable results. Even more complete coverage of the system is a part of post-war plans.

Accurate up-to-the-minute load information enables the load dispatcher to meet changing system conditions either of supply or demand with rapid and proper answers to his problems.

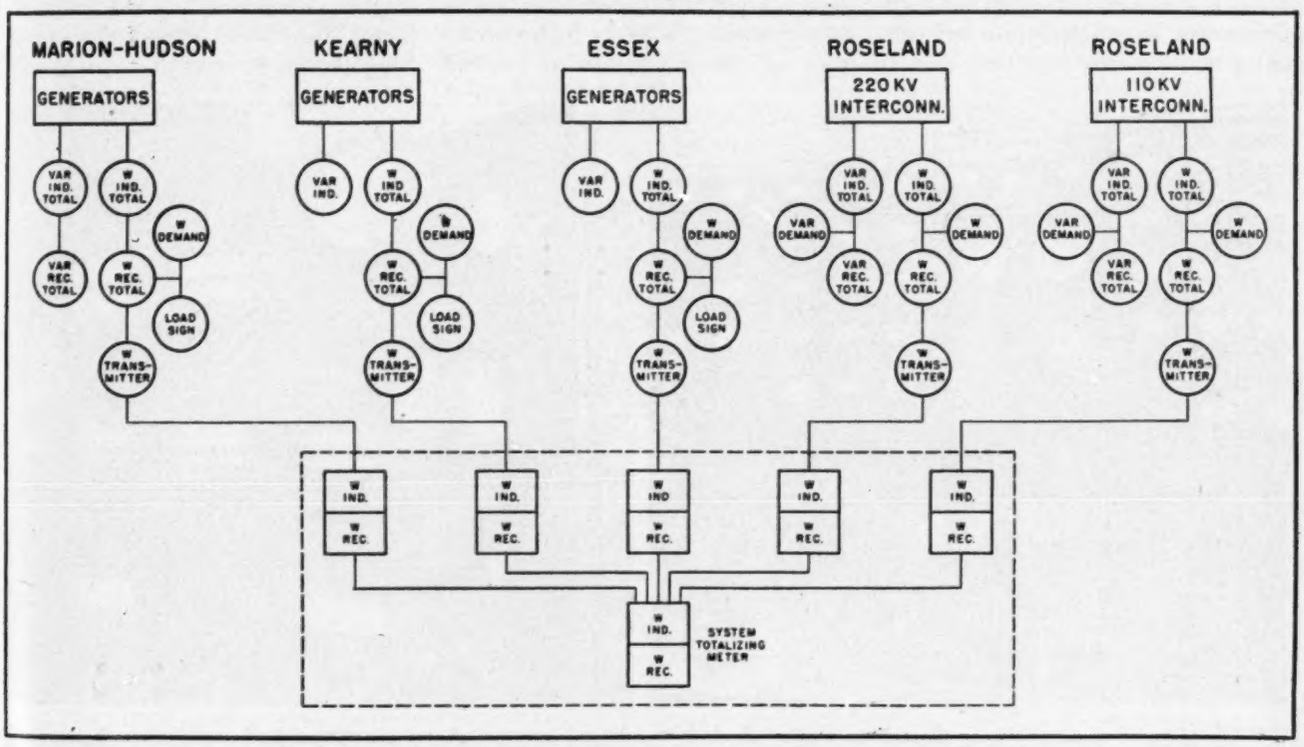
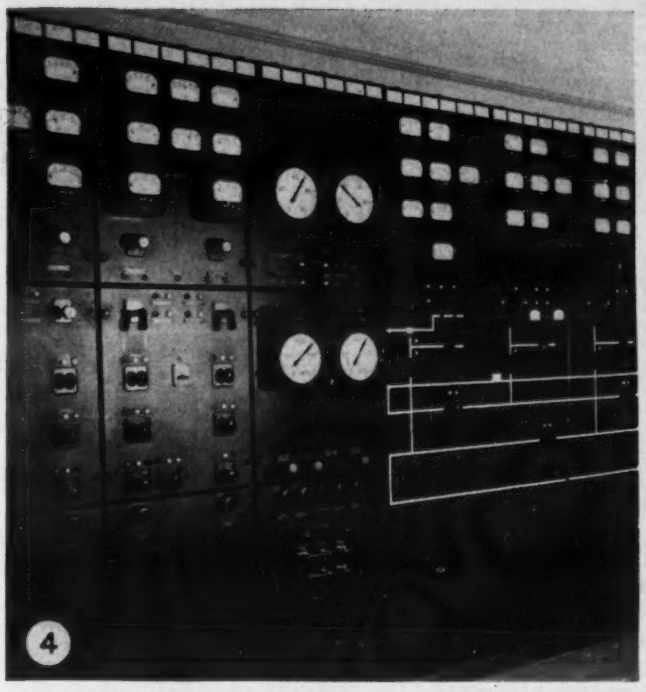
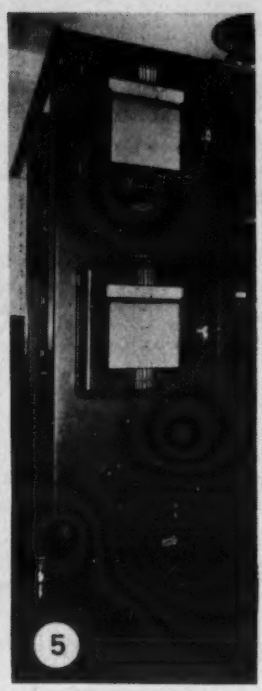


FIG. 3—In northern zone three generating stations and two interconnector points are provided with totalization and telemetering of watts as aid to handling of system at principal dispatching office





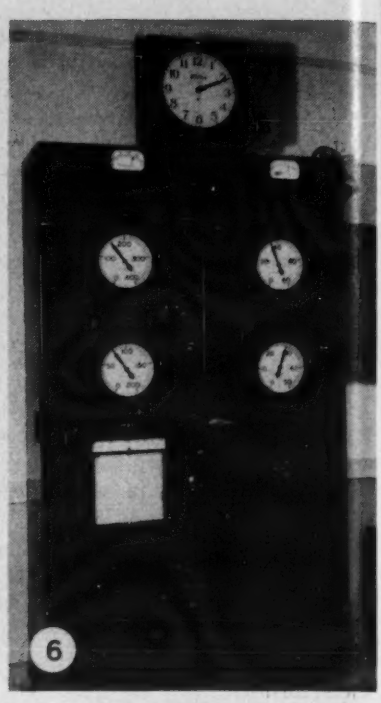
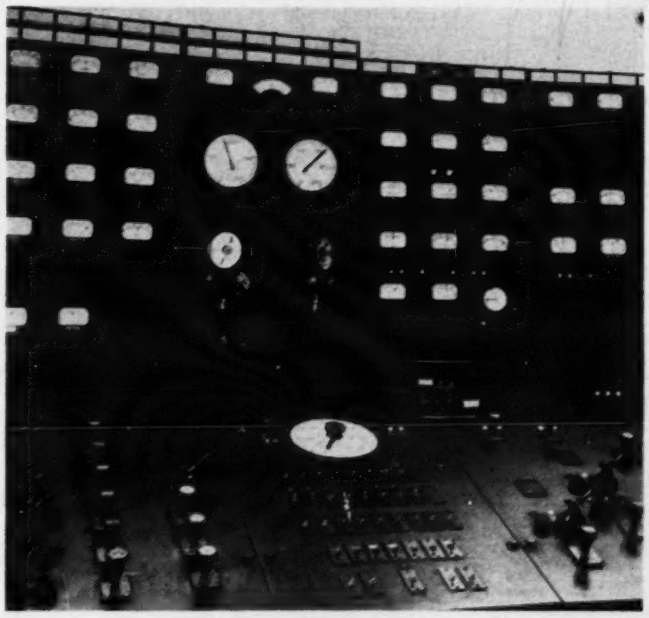


FIG. 4—Indicating totalizing watt- and varmeters, main switchboard, Burlington, N. J. FIG. 5—Transmitting equipment, Burlington generating station. FIG. 6—Receiving equipment installed at southern zone load-dispatching office, Burlington, N. J.

It provides him with immediate knowledge of conditions which word of mouth communication would have given him only after a delay of several minutes, minutes which in an emergency might mean allowing a bad operating condition to develop.

Properly recorded meter readings make possible an analysis of system operating conditions after the facts themselves have developed and are of great use to the engineer who is involved in an analysis of operating conditions or to the engineer who is engaged in system planning. Also, when a large system is operated in conjunction with two other equally large systems, as is the case in Public Service participation in the Pennsylvania - New Jersey interconnection, full and immediate knowledge of each system's present operating condition is a necessity. With the highest economy of operation, such as wartime particularly demands, this same accurate and immediate knowledge of the system is required.

Blocks of power traveling in different directions at different times must be measured and known if they are to be controlled. With proper metering arrangements tie lines have been more heavily loaded and generator unit scheduling more closely controlled, thus giving fuller utilization of capacity available at all points.



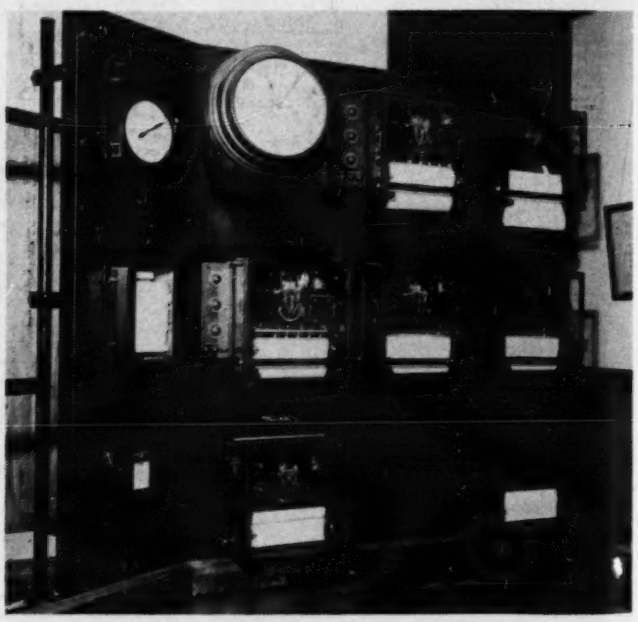


FIG. 7—Generators at Marion generating station feed into 13-kv. subtransmission system; indicating totalizing watt- and varmeters are used for local station operation

FIG. 8—Marion generating station load combined with the loads telemetered from other stations and ties in the system totalizing wattmeter

Telemetering and totalizing has been found superior in accuracy to telephoned information.

In connection with the extensions to its dispatching metering required by the addition of new generating units at widely separated points on the system Public Service has made use of the impulse duration system of telemetering. For the basic reading in kilowatts at the generator a thermoverter or thermal wattmeter was used. This device develops a direct-current potential that is directly proportional to the alternating-current watts input and is used with conventional current and potential transformers. Since the output of the thermoverter is direct current, any number of them may be connected in series, thereby supplying a totalized

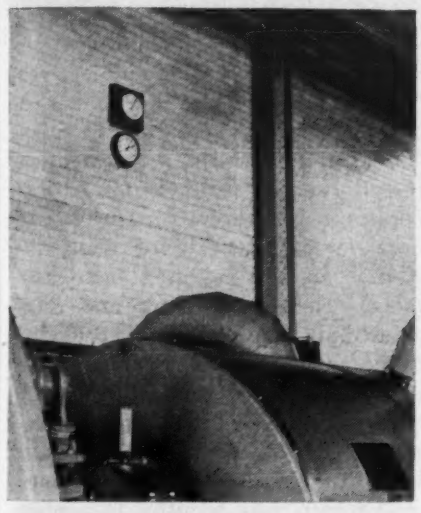


FIG. 9—Marion generating station load indicator in turbine room

reading. The output of the thermoverters is measured by either recording or indicating potentiometers equipped with impulse duration transmitters and transmitted to recording or indicating receivers. In this system both the transmitter and receiver are activated by a synchronous motor and no synchronization between the transmitter and receiver beyond that coming from the common 60-cycle system frequency is required.

There is no limit to the number of receiving meters that can be used on this circuit. One significant feature of the impulse-duration system is the ease with which it can be adapted to a carrier-current scheme of transmission whenever such a system is installed to supplement the present system of leased circuits.

Industrial Processes and Electrical Design

Reliability of electricity supply should be balanced in terms of cost against effects of interruption — Extremely high degree of reliability not justified in cost unless process actually requires it

CARROLL H. SHAW, Consulting Engineer, New York, N. Y.

THE requirement of dependability of electric power supply to an industrial plant should be established to a considerable extent by the inherent characteristics of the plant process. Dependability is a relative quality that can be improved to almost any desired degree, but at increasing cost as the degree approaches perfection. The optimum of reliability of power supply for any plant will be determined by a balancing of the characteristics of the production process, the production schedule and the details of plant construction, and it may be changed radically by war, by peace, by competition and by decisions of the management.

Increment expenditures that are made specifically to increase the dependability of any function of production should be related not only to increase in total production or to improvement in quality of the product, but should be considered as being subject to a higher rate of depreciation because of the imminence of loss of value of the expenditure through obsolescence, change of use or change of product.

Basis of Design

The electrical design of every plant should be based upon a predetermined degree of reliabiity. If it is considered that a higher degree may be desired at some later time, provision for space for reserve equipment can be made, based upon an upper limit of dependability to which the plant can be adjusted. The extent to which the operating results of the plant correspond to the predetermined requirements for dependability is a measure of the skill and ability of the designers.

Continuous Process

As an example of a plant that requires the very maximum of reliability of all four functional elements of generation, transmission, distribution and application of electricity, consider the problems presented in the design of an electrometallurgical plant in which the following conditions exist:

Total electric load is estimated at 200,000 kw., of which 120,000 kw. will be absorbed by an electrolytic process which is the controlling factor in both plant design and operation. The process has several unusual, inherent characteristics. First the load is built up by daily increments until all of the units are in production, after which the process continues uninterruptedly for weeks and perhaps even months until replacement of parts is required. Production is a function of the current used; below 65 percent of full current production ceases and below 60 percent the electrolyte begins to solidify. If current is cut off completely for more than four hours the electrolyte will solidify, and if this freezing is complete it is estimated that the cost of getting the plant back into full operation would be between ten and fourteen million dollars and would require about six months to attain full rated output.

Here the total failure of electric power supply is a catastrophe against which every possible protection must be provided, and the secondary goal is to limit any failure to a reduction

of not more than 35 percent of full load rating. Thus a very maximum of reliability for at least 65 percent of full load is determined by the process itself, and a still higher percentage might be necessary if the operation of the auxiliary process units cannot be insured by means of reserves of semi-finished materials on hand to be drawn upon at will.

It is obvious that no duplicate source of power generation can be provided economically for a load as large as this, so that the electric system that is selected to serve this plant must have adequate reserve, in an emergency, to carry at least 65 percent of the load. The number and capacities of transmission lines, the sizes and arrangements of transformers, the locations and speeds of oil circuit breakers are all items of vital importance in the design of the electric power supply where any failure or outage that cannot be circumvented almost instantly may result in tremendous loss.

External Heat Process

Another example is that of an electrometallurgical plant quite similar to the one just described, except that the process provides for the application of heat to the electrolyte from oil or gas furnaces. This external heating is part of the normal production operation, and by providing maximum reliability of power supply for the fuel pumps the danger of solidification of the electrolyte due to main power outage is eliminated. It is a relatively simple matter to obtain a small auxiliary power supply either from some independent outside source or from an emergency reserve gasoline engine-driven generator, or both.

In a plant operating this process the need for maximum reliability of power supply is far less imperative than in the preceding case, and after provision has been made for an adequate reserve emergency power supply, the design of electrical equipment can be restricted to a minimum of reserve and spare equipment.

In a third type of plant, producing the same finished product as the two plants already described, the process is arranged so that there is no electrolyte to freeze and no facilities are required to support part of the plant load or to maintain some special fuel supply operation. Here, if power is cut off, the plant just stops. When power is restored a certain period of time must elapse while reheating of raw material in process takes place, after which plant production resumes under full load, and there is no loss or waste of material involved. In this case no form of reserve or emergency power supply is called for.

In all of the three examples the importance of maintaining production, regardless of cost, during wartime is recognized, but under peacetime operation the need for the product in undiminished quantities every day would not exist. Under these peacetime conditions the plant described in the first example would operate under a continuous handicap of having to maintain a maximum dependability for its power supply, under penalty of suffering tremendous operating losses, even though there were no wartime necessity for its product. The peacetime advantages of a plant such as that cited in the third example as against those of either the first or second examples are obvious.

• • •

Cleans Heat Exchanger by "Water Shock"

By A. G. ROSENBAUM
Louisville Gas & Electric Company, Louisville, Ky.

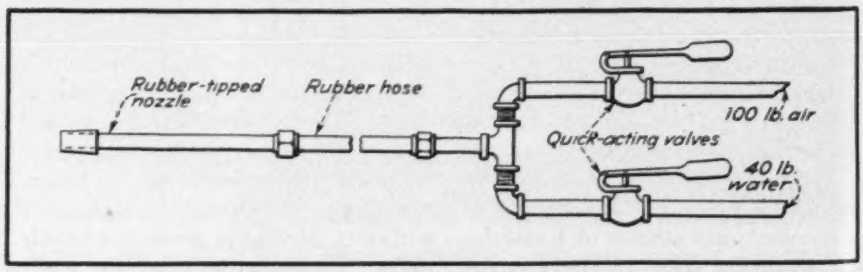
Methods of removing deposits from heat exchangers and condenser tubes are quite as numerous as the types of deposits encountered. Among the more unique but none-the-less effective methods for sluicing mud and *soft* deposits from such tubes is one using a "water shock" principle. It was employed by the Louisville Gas & Electric Company on condensers until chlorination equipment was installed, and is still used to remove mud from heat exchanger tubes of generator air coolers following spring freshets on the Ohio river.

The operation involves injecting "bubbles" or "slugs" of air at about 100 psi., into water entering the heat exchanger tubes, periodically at short intervals. It was found that the shock imparted to the tubes in this manner was sufficient to knock mud or sludge free and allow it to pass on out of the exchanger to the sewer. For convenience a tee-connection was added to the inlet water line of the exchanger and connected to the 100-lb. house compressed air supply line. A quick-opening valve was placed in the air line to facilitate the admission of air. While this practice works well for mud and soft sludge it will *not* work at all for scale or any of the harder deposits.

This same principle in a somewhat different form was used for cleaning condenser tubes, prior to installation of chlorination equipment. In this application, however, a rubber-tipped nozzle was necessary for ready insertion in the various condenser tubes. As shown, water and compressed air connections were provided to the nozzle with quick-acting valves in both the water and air lines. A quick-acting valve was only necessary in the air line, but was added later to the water line to save time.

Two men were required to operate the cleaning nozzle; one to hold the nozzle and the other to operate the valves from outside the condenser water box on signal.

Sequence of the operations was as follows: Insert the nozzle in the tube; open the water valve; open and close the quick-acting air valve once or twice, and finally close the water valve preparatory to moving the nozzle to a new tube.



NOZZLE admits alternate slugs of water and air into condenser tubes to remove soft deposits by water shock method

Flood-Proof All-Wood Towers Support 132-Kv. River Span

Indiana utility designs and builds 95-ft. compound tower to support 1,000-ft. span of 132-kv. conductors — Designed with floods in view, it withstood record Wabash River flood its first year

W. A. SCHULZ, Transmission Engineer, Public Service Co. of Indiana, Inc., Indianapolis, Ind.

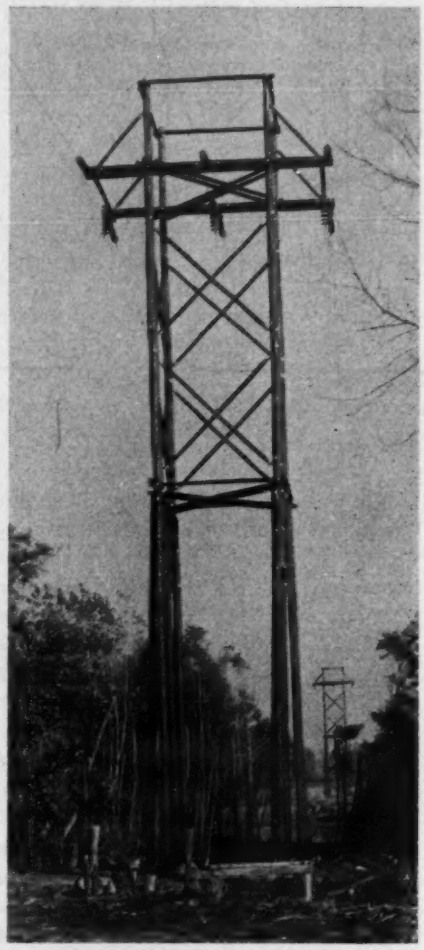
MOST MAJOR FLOODS take their toll of river crossing towers. The Wabash River flood of May, 1943, was no exception, being the biggest on that river since 1913. Two towers that it didn't get, however, were the new and unconventional 95-ft. all-wood structures that were built by the Public Service Company of Indiana, Inc., to support a 132-kv. river crossing span.

This single-circuit line crosses the Wabash River in a wide bottom requiring a 1,000-ft. span over the river.

Design Established

When WPB disapproved steel structures for this crossing, recommending wooden pole structures instead, the "shoulds" and "should nots" of the design were well established. Previous experience of the company with guyed structures in river bottoms had been bad. They showed a uniform tendency to collect debris during floods and to fail in the spring under ice action. The new towers, therefore, *should not be* guyed. They *should* gather the least possible debris during flood and they *should* have the maximum possible resistance to wear and impact from floating ice.

A compounded tower—composed of groups of members—was indicated. This, because an attachment height of 85 ft. and a tower height of 95 ft., was required to give the necessary 19-ft. clearance above high water and floating debris. Sag is 30 ft. for the three 12-strand Copperweld conductors, which have an O.D. of 0.522 in. and are similar to type VCW. The tower supports two overhead ground wires as well as the three circuit conductors.



COMPLETED TOWER is square, 14 ft. on a side; legs consist of three 55-ft. poles set 10 ft. deep and supporting 60-ft. pole with a 10-ft. lap; 35-ft. flood immersion was contemplated in design

The towers are square; sides are vertical and measure 14 ft. on centers. Tower legs consist of four 60-ft. class 3 creosoted yellow pine poles each supported by three 55-ft. class 4 poles with a 10-ft. lap joint. The groups of class 4 poles are set 10 ft. deep. Since the tower is 14 ft. square the same round pine crossarms and X-braces could be used in its construction that were used in the balance of the H-frame line.

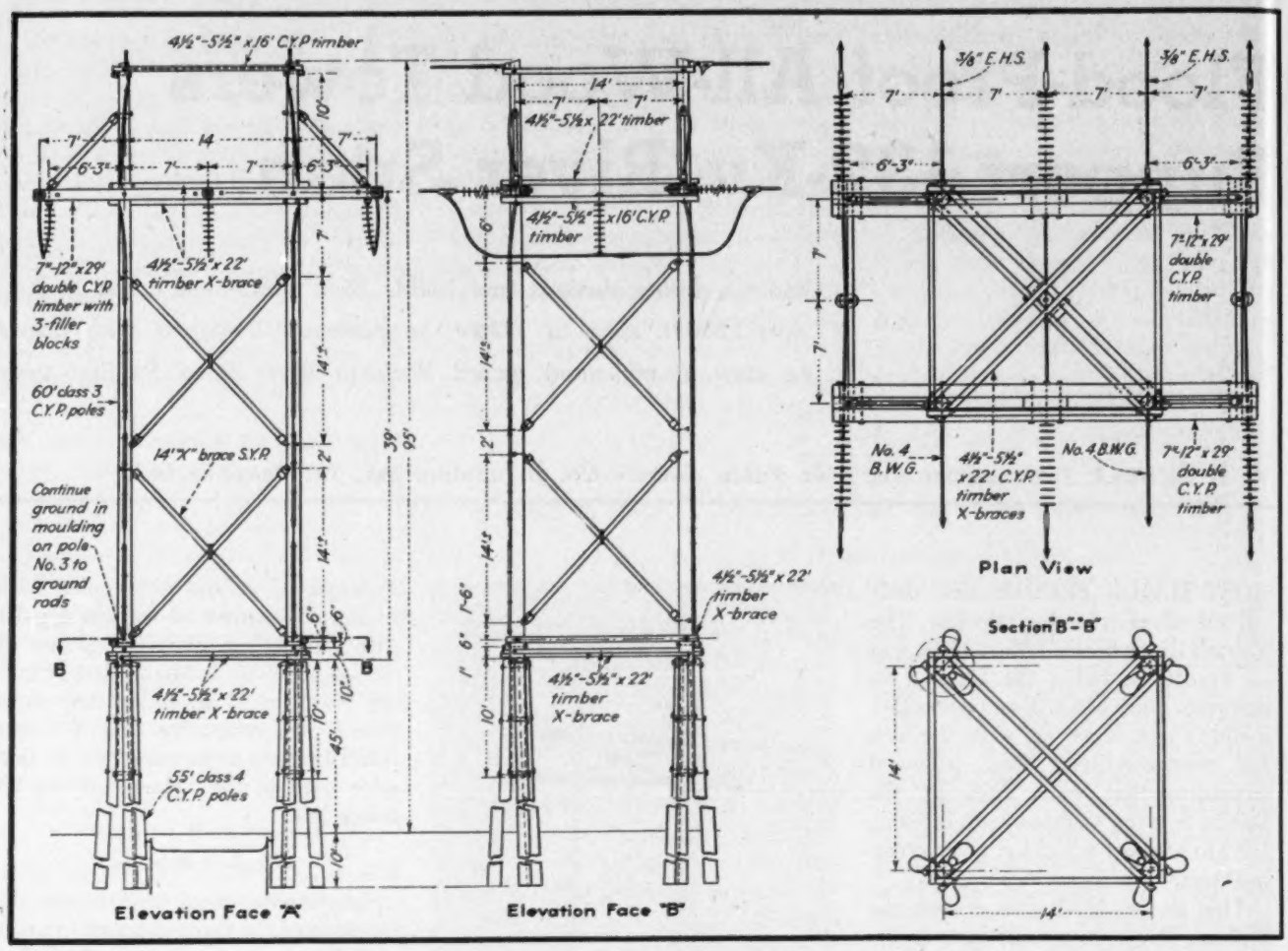
No Low Bracing

No bracing was used below the junction of the three supporting poles and the long upper pole. A 35-ft. immersion of the bottom of the tower was expected during floods and any bracing below this level would obviously gather debris. At the 45-ft. level horizontal X-bracing was used for torsional stiffness.

The towers were designed to withstand the unbalanced loading due to the difference in tension in the river crossing span and the adjacent H-frame span. This unbalanced loading is a net of 2,400 lb. for the two overhead ground wires; 3,000 lb. total for the three phase conductors.

To withstand the overturning moment due to this unbalanced load creosoted log anchors (about 8 ft. long, 14 in. in diameter) were attached to the two legs of the tower that would act in uplift. It is estimated that an uplift of 20,000 lb. would be required to pull these anchors out of the ground.

Towers were not designed to withstand the broken tension of the line. Conductors in the H-frame sections of the line are at 4,500 lb. tension under heavy loading conditions. This compares with 5,500 lb. conductor tension in the crossing span. These loaded tensions would exist on a con-


4½"-5½" x 16' C.Y.P timber
7"-12" x 29' double C.Y.P timber with 3-filler blocks
4½"-5½" x 22' timber X-brace
60' class 3 C.Y.P. poles
14' "X" brace S.Y.P.
Continue ground in moulding on pole No. 3 to ground rods
55' class 4 C.Y.P. poles
Elevation Face "A"
Elevation Face "B"
3/8" E.H.S.
No. 4 B.W.G.
Plan View
Section "B"-"B"

UNGUYED wood square river-crossing tower has three 60-ft. CSYP poles for each lower leg and carries three 0.522-in. Copperweld conductors and two ground wires

ductor with a breaking strength of 18,730 lb. The safety factor is considered sufficient to take care of any undue strain on the conductors that might lead to breakage.

Scale Model Built

After the tower was designed to meet these loading conditions a scale model was built as a qualitative rather than quantitative measure of the stresses, particularly torsion. The desirability of adding horizontal X-bracing for stiffness at the 45-ft. level was clearly demonstrated on the model.

From previous full structure tests of cross-braced H-frames it was known that one panel of the type used in the tower would carry approximately a 6-ton load at failure. It was considered safe to assume that a tower built up of such panels would be adequate for the expected unbalanced load of 5,400 lb. and the design was accordingly accepted.

In assembling the tower it should be noted that the groups of three poles at the structure corners were set and tamped in while inclosing the upper center pole, butt of which rested on the ground. This upper central pole was then raised into position by a 70-ft. gin pole and lashed in place while pilot bolt holes were bored.

No difficulty was experienced in leveling the groups of compounded poles since each was set to specified elevation. All framing dimensions were referred to the base of the pole.

Erection of the structure was done by the company's own construction crews, using standard line trucks and a tractor all equipped with winches. No heavy or special construction equipment was required. The work crew consisted of 18 men and was made up of six linemen, nine groundmen, one foreman and drivers for the caterpillar tractor and line trucks.

Labor and material costs on a per structure basis for the all-wood design and for the 17,240-lb. steel tower that would otherwise have been used follow:

Wood Structures—Actual

95-ft. wood tower — all materials — per tower	$1,344
Labor for installation, transportation, etc. per tower	1,465
Total	2,809

Steel Tower—Estimated

Cost of steel—per tower	$ 900
Labor—total per tower	1,000
Total	1,900

These data do not include the cost of stringing the conductors ($1,179). They apply only to the work of erecting the tower. It should be noted, however, that much of the work of erecting the wooden structures had to be done on an overtime basis. Labor costs given above are, therefore, disproportionately high compared with the labor cost of the steel tower estimated on a straight time basis.

About two weeks elapsed time was required to complete the river crossing installation, including stringing the wire and erection of the towers.

Hutsonville Station Planned for Simple, Low-Cost Operation

Two-unit, 50,000-kw. station designed for low-cost operation has majority of plant equipment on one floor — Control of station and switchyard equipment centralized on operating floor — Metal-inclosed loop bus serves auxiliaries of each station unit

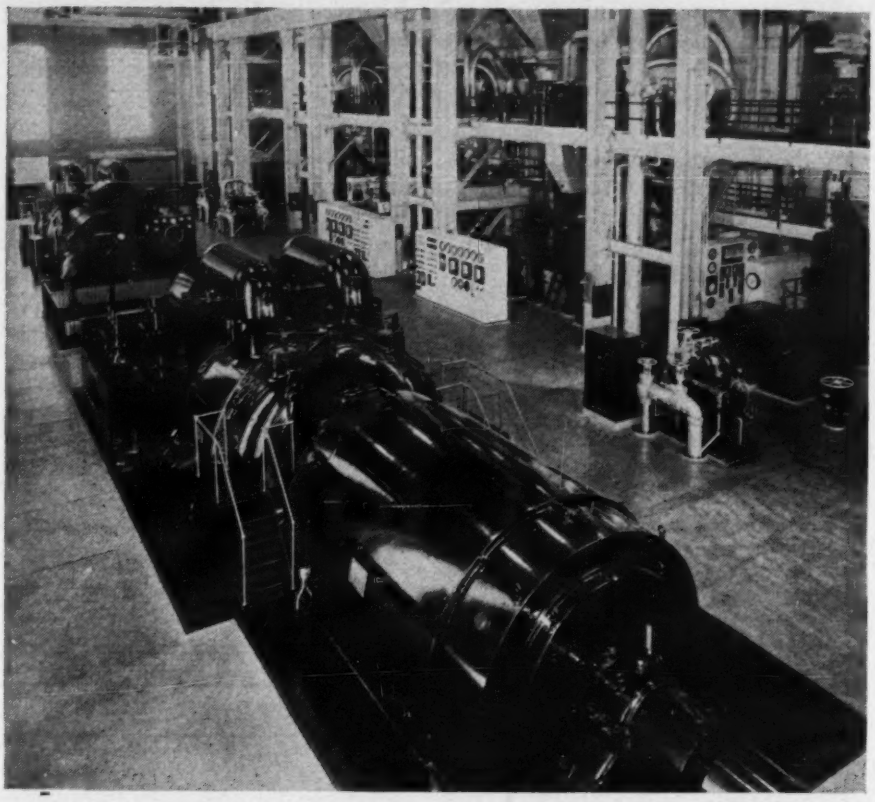
J. D. ROBERTS, Chief Engineer, Central Illinois Public Service Co., Springfield, Ill.
L. SKOG, Vice-President, Sargent & Lundy, Chicago

FROM its conception the 50,000-kw., two-unit Hutsonville steam generating station of the Central Illinois Public Service Company, on the Wabash River, was planned as a system load plant, to operate interconnected with the company's 50,000-kw. Grand Tower and 25,000-kw. Muddy stations in southern Illinois.

As a system load plant Hutsonville was designed and constructed to yield the lowest power cost commensurate with a minimum investment. Simplicity of design and operation was a definite requirement.

These requirements led to a number of design features in station arrangement, for which the station is unusual. Practically all of the operating equipment in the station is on the main floor; there is no wall between the boiler and turbine room; boiler control boards for the four boilers are paired, permitting one man to handle two boilers; turbine gage boards and electrical switchboards are integral and located near the boiler control panels. Thus operating control of the station, including control of the main units and outdoor switchyards, is unified. And, finally, because of its location on the Wabash River, the station is arranged for successful and continuous operation through floods with water 10 ft. above normal high water elevation.

Hutsonville is a two-unit plant. The unit plan of design has been strictly adhered to throughout. The first 25,000-kw. unit was placed in operation in April 1940, 10½ months after breaking ground. It consisted of two 180,000-lb.-per-hour (max., rating) pulverized fuel-fired boilers burning southern Illinois coal and delivering steam at 665 psi., 835-deg. F., tandem-compound turbine operating at 3,600 r.p.m. A second identical turbine-boiler unit was placed in operation in September, 1941.

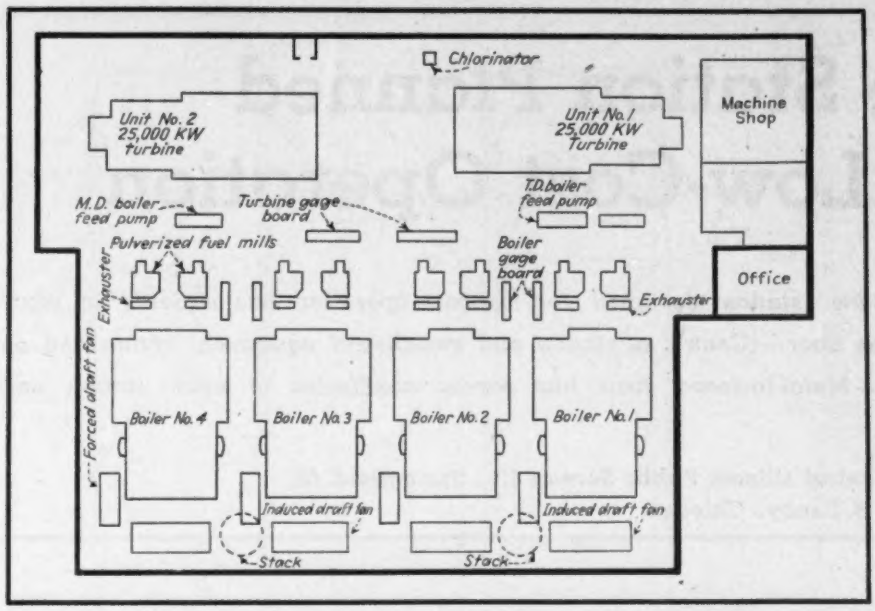


MAIN OPERATING FLOOR—Note absence of curtain walls; turbine gage boards and electrical switchboard are integral; boiler control panels are paired for adjacent boilers and are adjacent to turbine gage board and electrical switchboards; pump and mill motor switchgear are adjacent to each piece of apparatus

Proposed performance diagram for the two identical station units for the full load condition is shown. Design efficiencies anticipated were as follows:

Generator output, kw	25,000
Water rate to throttle, lb. per kw.-hr.	9.06
B.t.u./kw.-hr. to turbine	9,876
Boiler efficiency, percent	86
B.t.u./kw.-hr. generated	11,484
B.t.u./kw.-hr. to auxiliaries	700
B.t.u./kw.-hr. output	12,184
B.t.u./kw.-hr. sendout	12,880

Operating results for the six months next following installation of the sec-



GENERAL MAIN FLOOR ARRANGEMENT of the station groups, control and equipment of each unit on one level for simplified operation with minimum attendance

ond unit at Hutsonville revealed that the station is very closely approaching these designed efficiencies. Average power factor of the load is 94 percent. In operation two boilers with one turbine will carry a continuous load of 28,000 kw.

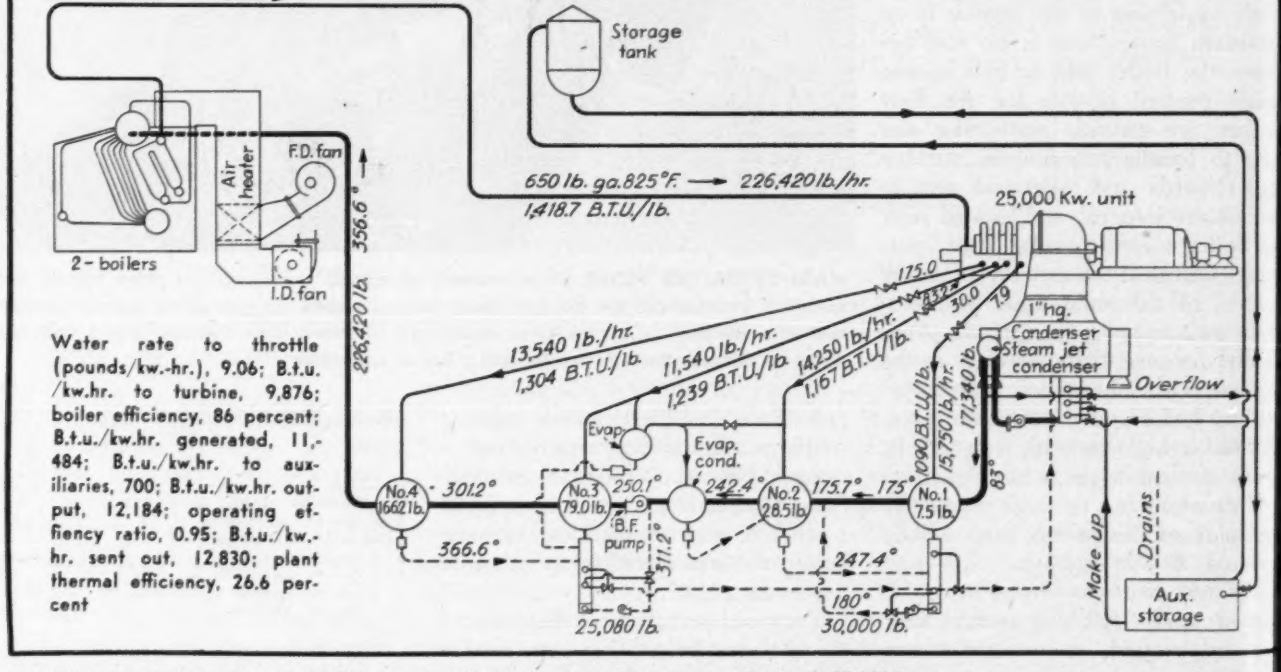
Station Structure

The main station, crusher house and scale house buildings are constructed on reinforced concrete substructures resting on a sandstone formation. Superstructure is of brick and steel. Glass block was used in place of conventional windows. Ventilating louvers have been provided at main floor ceiling level and basement ceiling level above and below each east and west windows. Through these louvers air is admitted to the basement and under the main floor roof. At the main floor level a border grating surrounds each boiler. This provides a pipe passageway and direct air connection between the main floor and the basement, permitting air flow up and along the ash hoppers and boiler jackets. Forced-draft fan inlet ducts extend to the roof level between each boiler. Louver openings have adjustable dampers by which air can be supplied to the forced-draft fans from the main floor ceiling level, through the basement ceiling level by way of grills around the boilers, or a combination of both arrangements. This effectuates ventilation by removing accumulations of warm air above the boilers and supplies air heaters with air at higher initial temperatures. This contributes to fuel economy and reduces the sweating of air heater tubes.

Allocation of space in the building on a volume and area basis is as follows, based on 50,000 kw. installed capacity:

	Volume Cu.ft./Kw.	Floor Area Sq.ft./Kw.
Boiler room	17.2	0.25
Turbine room	12.9	0.174
Machine shop	2.2	0.035
Office, locker and storage	0.3	0.008
Total	32.6	0.467
Intake crib (two units)	0.51	0.008
	33.11	0.475

The building is constructed and arranged for successful, continuous operation during floods with water 10 ft. above high stage. To facilitate operation of the station under such conditions a hatch with removable cover and an auxiliary coal chute



Water rate to throttle (pounds/kw.-hr.), 9.06; B.t.u./kw.hr. to turbine, 9,876; boiler efficiency, 86 percent; B.t.u./kw.hr. generated, 11,484; B.t.u./kw.hr. to auxiliaries, 700; B.t.u./kw.hr. output, 12,184; operating effiency ratio, 0.95; B.t.u./kw.-hr. sent out, 12,830; plant thermal efficiency, 26.6 percent

DESIGN PERFORMANCE DIAGRAM for one of Hutsonville station's two identical 25,000-kw. units

ere installed in the roof of the rusher house. This permits coal to e delivered by the locomotive crane irectly from the coal cars through e roof of the crusher house to the rusher and coal conveyor if No. 1 onveyor and track hopper are ooded.

Plant Layout

Practically all station operating quipment is located on the main oor. This includes the boilers, main enerating units, forced and induced raft fans, pulverizers, boiler feed umps, coal bunkers, coal scales, oiler control boards, turbine room age boards and electrical switch-oards. Two small air compressors re on the basement floor level. Cir-ulating, condensate, heater drain, ervice and other miscellaneous umps are located in the condenser it.

Boiler control boards are located pairs adjacent to the boilers they ontrol, and near the coal pulverizers. ontrol boards face each other in the isle between pairs of boilers. A ingle boiler attendant can thus han-le two boilers and their associated quipment either manually or by full utomatic control. This arrangement f control stations and plant equip-ent permits operating with a mini-um of attendance. The entire staff f this station of 50,000 kw. capacity otals 49 employees.

Turbine room gage boards and the lectrical switchboards for each gen-rating unit are arranged as an in-egral combination and are located djacent to generating unit and near e boiler control panel for the re-ted boilers. Thus from the boiler ontrol boards and the neighboring witchboards and turbine gage boards l of the operating control of the ation is effected, including control f the outdoor switchyards and power pply to station auxiliaries.

The two 715-g.p.m., 3,600-r.p.m., 50-psi. motor-driven boiler feed umps and a spare turbine-driven ump that provide all the boiler edwater requirements are located the main floor adjacent to the oilers and to the main generating nits, convenient to the boiler control anel. This permits either the boiler perator or the turbine room attend-nt to operate these pumps.

Forced and induced draft fans, of hich there are one per boiler, are located on the main operating floor level behind the boilers. The induced draft fans, rated 80,000 c.f.m., are each driven by two induction motors, one 200 hp., 1,200 r.p.m., and the other 100 hp., 900 r.p.m. The 51,000-c.f.m. forced draft fans are each driven by one 1,200-r.p.m., 125-hp. motor. Both forced and induced draft fans are equipped with inlet vane control. Inlet ducts of forced draft fans extend vertically to the top of each boiler.

Feedwater heaters of the vertical type are located adjacent to the turbine foundation in the basement. Removable hatchways have been provided above the heater to permit reaching them with the turbine room crane. The main floor hatchway permits the turbine room crane to serve the condenser pit. The plant machine shop is located at the south end of the turbine room and it also is served by the turbine room crane.

INDIVIDUAL sectionalized metal-inclosed loop buses on ceiling of basement supply station auxiliaries for units 1 and 2

Auxiliary Power Supply

All auxiliaries in the station are electrically driven with the exception of the spare steam-driven boiler feed pump, already mentioned. A complete and flexible unit auxiliary power system is provided for each turbine, its two boilers and associated auxiliaries by means of a novel metal-inclosed loop bus running around the basement ceiling. This bus is supplied from the main auxiliary transformer directly connected to the terminals of each generator.

Grouping of the auxiliaries with respect to the sectionalizing scheme of the main 460-volt, metal-inclosed auxiliary loop bus permits the greatest flexibility in operation of the two main generating units and their associated boilers.

As an emergency supply these loop buses, one for each boiler turbine unit, are supplied from a reserve auxiliary transformer connected to the 69-kv. main bus in the switchyard. All auxiliary drive motors are cross-line start type and are connected directly through their control switches to the main auxiliary bus. Power supplied to each unit section of the auxiliary bus is controlled by air circuit breakers from each main auxiliary and reserve auxiliary transformer. These circuit breakers are interlocked and the reserve auxiliary power transformer automatically supplies power to either unit section in event of failure of power supply from the respective unit's main auxiliary transformer. Power for the reserve auxiliary transformer is supplied from the main 69-kv., bus and in emergencies power from other sources

can be supplied to this bus by three independent 69-kv. transmission lines. The auxiliary buses are equipped with sectionalizing switches and crossties between the unit sections.

Unit Plan of Design

The unit plan of design has been strictly adhered to throughout the station. The only interconnection between the high-pressure steam system of the two units is through the main steam header and the auxiliary steam header. The main high-pressure steam supply system consists of a single header from each boiler to the main steam header and this is a single 10-in. header to each turbine. The 3-in. auxiliary steam header is connected to the main 10-in. steam header between the boiler connections of each unit.

Make-up water can only enter the boiler feed system through the condenser hotwell; the feedwater system is strictly a closed system. Deaerating features incorporated in the main steam condenser have functioned in a very satisfactory manner, resulting in complete elimination of air, oxygen or other non-condensables from the feedwater.

Station water supply is obtained at 65 deg. F. from two deep well pumps located south of the station. It is used for cooling all bearings, for generator air coolers, oil coolers, air compressor jackets, plant drinking and sanitary uses. Water for sluicing ashes is obtained direct from the main circulating water intake, as is the water for washing screens. Ground water system and the rivers circulating water system can be interconnected when required by emergency conditions. The supply to the evaporator for the boiler feed and make-up system is obtained from the ground water supply.

Electrical System

The main 69-kv. station bus is in the outdoor switchyard. A reserve or transfer bus permits removal from service of any of the circuit breakers or the main bus in the yard without interfering with station operation. Main 13.8/69-kv. transformer banks are connected directly to their respective generators. The 69-kv. oil circuit breakers between these transformer banks and the 69-kv. buses are in effect the generator oil circuit breakers. The main auxiliary transformers for each generator are connected directly to their respective generators. They supply the station auxiliaries for each respective unit through the armored auxiliary bus system.

There is one spare 69,000/1,460-volt auxiliary transformer. This can be connected to external sources of power through the 69-kv. bus system. Thus it can be used as a spare either for the main auxiliary units or directly to furnish starting energy from the transmission system in event of a complete shutdown of the station. All synchronizing of the main generating units is effected through the 69-kv. bus system.

Station lighting is supplied for each generating unit from its section of the auxiliary bus system. Small induction voltage regulators have been provided to regulate the lighting voltage since it is necessary under certain conditions of operation to regulate the voltage of the transmission system by adjusting the main generator voltage. These small induction voltage regulators maintain uniform lighting voltage level and effect material savings in the cost of station lighting and lamp renewals.

The station is equipped with all of the necessary graphic recording instruments covering all phases of plant operation. These instruments are equipped with electric motor-operated clocks. A reserve supply for the clocks in these instruments is obtained through small motor-generator sets directly connected to the station battery. Thus in event of any station interruption the clock system of the recording instruments is not affected. Certain portions of the station lighting system are also automatically connected to the main storage battery should the lighting circuit voltage fail.

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Cleaning Coded Wire and Terminal Blocks

Two new cleaning and salvaging methods, one for cleaning coded meter wire, the other for restoring carbonized meter terminal blocks, have been developed in the Detroit Edison Company meter department. Both methods were introduced subsequent to publication of the article "Salvaged Meter Parts Given Chemical Cleaning," by W. A. Sturdevant in ELECTRICAL WORLD of September 20, 1941.

Cleaning Coded Meter Wires—When color-coded meter wire is pulled in and out of conduit it frequently becomes so dirty that it is difficult to distinguish the color coding. With careful cleaning it can be restored to usable condition without damage.

Wire used at Detroit is described as seven-strand annealed copper wire, tinned and stranded in accordance with A.S.T.M. specifications B-38 and B-8 respectively. Each conductor is surrounded with a wall of "easy stripping rubber" insulated to a thickness of $\frac{3}{16}$ in. This is covered with one soft, dry, clean cotton braid. The braid is closely woven cotton thread tight upon the rubber covering and is at least two-ply. Colors are not to fade when subjected to sunlight, nor run together when exposed to moisture. No. 10 wire meeting these specifications is used for connecting current transformers to meters, No. 12 wire for the potential circuits.

To clean the wire the following solution is used:

½ oz. sodium-phosphate tri-basic.
½ oz. Fels-Naptha soap chips.
1 oz. laundry bleach.
30 oz. cold water.
Mix well and allow to settle.

Wire to be cleaned is scrubbed with a solid brush and solution and rinsed with cold water. Excess rinse water is then removed with compressed air and the wire allowed to air dry.

Restoring Carbonized Terminal Blocks—Procedure to be followed in restoring plastic meter blocks that have been carbonized by the action of an electric arc is outlined as follows:

1. Badly carbonized spots are first scraped with a sharp knife.
2. Entire burned area is then brushed with glacial acetic acid. (Acid should remain on block until nearly dry.)
3. Block is rinsed in milk alkali solution. Alkali solution concentration—8 oz. Triad II (Sold by Detroit Rex Products Co.); 1 gal. water with temperature 180 to 185 deg. F.
4. Block is next rinsed in running hot water.
5. When dry, block should be sprayed with red glyptal (1-1 solution) and baked for four hours at 125 deg. F.

POST-WAR LOADS ON ELECTRIC UTILITY SYSTEMS

By CONSTANTINE BARY

TWO GENERAL METHODS for determining probable post-war behavior of electric system loads are developed in this article, which was undertaken in the expectation and hope that it may serve the useful purpose of stimulating thoughts on post-war planning. The scope of this study is limited to an outline of the major features of electric utility systems' load behavior so far during this war, and to an illustration of the possible manner of change in electric loads in the post-war period. Numerical values used should not be construed as forecasts of future conditions, but rather as indicators of a general method of approach for sizing up future possibilities, based on present ideas for desirable levels of production and employment in the post-war period.

A complete and precise picture of the behavior of electric loads in the post-war period cannot be made at this time, because the war is not yet over, because there is no definite knowledge available as to when it will be over and because many factors of political and economic nature are far from having crystallized in even the rough outlines of the post-war world. No matter what ideas one may have at this time on the post-war situation, one will undoubtedly be proved wrong by what actually happens. But notwithstanding these considerations, the difficulties of foreseeing the future clearly, and the futility of trying to determine precisely the world of tomorrow, it nevertheless is highly desirable that some idea is obtained on the possible general trends of future loads, if the electric industry is to continue discharging its responsibilities after victory just as effectively as it has done in the past. Thoughts of tomorrow need not interfere with actions for today.

In discussing the possible post-war situation, it

The editors of ELECTRICAL WORLD asked Mr. Bary, who is rate research engineer of the Philadelphia Electric Company and consultant to the Office of War Utilities, to prepare this study because they thought the opinions of a well-known engineer and analyst of electric utility economics on post-war behavior of loads would be useful to the industry. The study is offered to readers explicitly as a statement of Mr. Bary's own views and is not necessarily an expression of either the Philadelphia Electric Company or the Office of War Utilities.

is difficult to divorce one's ideas from a consideration of the conditions that obtain during the war, since they will have a profound influence upon the post-war period. "What is past is prologue."

It is the object of this paper to outline the major features of electric load behavior during the war, and as earlier stated, to present two general methods for appraising its possible short-term trends in the post-war period.

In the discussion which follows use will be made of a hypothetical electric utility system which resembles in characteristics the average of major utility systems in the United States. Care should be exercised in the interpretation of these results for individual local situations which may differ, and in some instances quite widely, from those used in this paper. Nevertheless, it is believed that the conditions depicted for the hypothetical system will be valuable guides for a general framework of the complete picture and are indicative of the general trends.

BEHAVIOR OF LOAD DURING WAR

Analysis of major features of load behavior in the past few years of war can be segregated into two major categories: (a) The factual performance which can be obtained from actual statistical results. (b) An analytical review of actual performance, which can only be obtained from careful engineering studies of the major forces present in the creation of electric loads.

Factual Performance

From a review of factual data, the following major observations can be made as applied to the hypothetical system:

1. *Peak Load*—The peak load at end of year in 1940 was over 1.4 million kilowatts; in 1941 it grew to 1.58 million kilowatts, an increase of 13 percent over its 1940 value. At end of 1942 it stood at 1.65 million kilowatts, an increase of 4 percent over its value at end of 1941, and it is estimated that with the lifting of Army enforced dimouts at end of 1943 it will be 1.87 million kilowatts, or 13 percent higher than for 1942.

2. *Energy*—The annual energy output in 1940 was over 7 billion kilowatt-hours; in 1941 it rose to 8.1 billion kilowatt-hours, showing an increase of 16 percent over 1940; it reached 9.2 billion kilowatt-hours in 1942, an increase of 14 percent over 1941, and it is estimated that in 1943 it will be close to 10.7 billion kilowatt-hours, or 16 percent higher than in 1942.

3. *Annual Load Factor*—The annual load factor increased from 57 percent in 1940 to 58½ in 1941, and to 63 in 1942. Based upon the estimated peak loads, and energy output, the 1943 load factor should be close to 65 percent.

4. *Monthly Load Factor*—The monthly load factor at end of year increased from 60 percent in 1940 to 63 in 1941 and to 69 in 1942. It is estimated to be close to 71 percent at the end of 1943.

5. *Time Occurrence of Peak*—The occurrence of the system peak load in the winter months swung from the evening period between 5 and 6 p. m. occurring prior to war, to the morning period from 9 to 10 a. m. in 1942, and it is expected to continue occurring in the morning in 1943 and during the war so long as "War Time" remains in force. It should be noted, however, that the absolute evening peak in 1942 was close to the morning peak load level.

6. *Industrial Production*—The factual picture would not be complete if we did not mention briefly the outstanding features of one of the major economic factors which affects the behavior of electric loads. Chart I shows a plot of the Federal Reserve Board Index of Industrial Production (adjusted for seasonal variation) from the end of 1940 to the middle of 1943.

The Production Index at the end of 1940 stood at 140*. At the end of 1941 it rose to 178, showing an increase of almost 26 percent. At the end of 1942 it rose to 223, an increase of 21 percent over its value at the end of 1941; and it is estimated that by the end of 1943 it will be about 12 percent higher than at the end of 1942.

The annual index for 1940 stood at 125, and for 1941 at 162, an increase of 30 percent. For the year 1942 it was 199, an increase of 23 percent over 1941; and for the year 1943 it is estimated that it will be about 19 percent higher than for 1942.

Analytical Review

Before proceeding with a more detailed analysis of the behavior of the various forces causing the creation of electric loads, it may be of interest to digress for a moment and review briefly major elements of the Index of Industrial Production.

Index of Industrial Production—Chart I shows an

*1935-1939 Average=100.

estimated segregation of the total Index of Industrial Production into two major components—the amount applicable to war production, and the amount devoted to civilian production. This chart shows that at end of 1942 war production was responsible for 148 points of the total Index, and civilian 75 points. In other words, at end of 1942 war was absorbing 66 percent of the total production, and civilian 34 percent. By the middle of 1943 war was responsible for 164 points of the total Index, and civilian 72 points; *i.e.*, by that time war production was absorbing about 70 percent of the total effort and civilian 30 percent. Production for civilian use by the middle of 1943 corresponded to the average level of industrial production of 1933–1934.

Electric Load—In order to simplify this discussion and to accentuate changing conditions, the analysis of electric load behavior will be limited to the conditions at the end of the year. By and large, the end of the year conditions are of major significance to the electric industry and they depict with greater sharpness the successive changes from one year to another.

The quantitative values which are used herein represent the results of careful engineering estimates. By their nature they cannot be considered to yield answers of mathematical precision. But they are of sufficient accuracy to outline the broad features of electric load behavior during this war.

The results of these analytical studies for the hypothetical system are shown on Chart II, and give the following significant information:

1. The 1941 peak load at end of year was about 9 percent higher than the probable normal load would have been without the war. In 1942 the actual peak was almost 7 percent higher than the probably normal, and it is estimated that the actual load at end of 1943 will be 14 percent higher than the probable normal load.

2. The civilian load at the time of system peak at the end of 1942 was 30 percent below the probable normal peak load which it would have been without the war, and by end of 1943 it is expected to be 36 percent below the normal. Stating it in another way, the 1942 civilian load at end of year was 79 percent of its 1940 value, and by end of 1943, with the lifting of Army-enforced dimouts, it is expected to be about 77½ percent of the 1940 value. It should be noted, however, that had it not been for the existence of "War Time" and Army-enforced dimouts, civilian load at end of 1942 would have been 86 per cent and at end of 1943—83 percent of its 1940 value.

3. "War Time" and Army-enforced dimouts in 1942 effected a net saving in the system peak of the hypothetical system of almost 100,000 kw., or about 6 percent of the 1942 peak load. "War Time" alone is responsible for about 75 percent of this total saving.

4. The total war load at time of peak in 1942 was about 35 percent of the total peak load and by end of 1943 it is expected to be almost 45 percent of the total load.

5. The year 1942, in so far as electric loads are concerned, was a year of inter-reaction of several forces working in opposite directions. The net increase in peak loads of the hypothetical system from 1941 to 1942 of 70,000 kw. is actually made up of an increase in the war load of some 340,000 kw. and a decrease in load due to "War Time" and dimouts of about 100,000 kw., and a net effect of displacement and changes in civilian load of about 170,000 kw. In other words, 79 percent of the 1941–1942 increase in the war load was absorbed through the effects of "War Time" and dimouts and the net effects of displacement of civilian loads, and only 21 percent of it can be considered as new load. On the other hand, the estimated net increase in peak load from 1942 to 1943 of about 220,000 kw. is actually made up of an increase in war load of some 240,000 kw., a net effect of displacement and changes in civilian load of 40,000 kw., and the restoration of load on account of lifting of Army-enforced dimouts of 20,000 kw. In other words, only 17 percent of the 1942–1943 increase in war loads will be absorbed through the net effects of displacement of civilian load and 83 percent of it can be considered as new load.

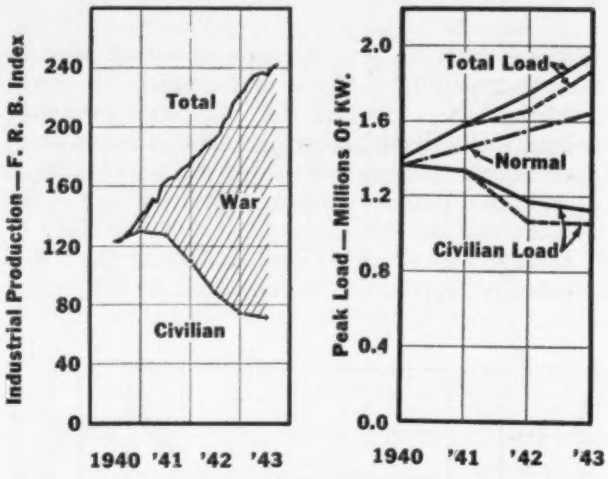

CHART I (left)—Estimated segregation of Federal Reserve Board Industrial Production Index (1935-1939 average = 100) into war and civilian components

CHART II (right)—End-of-year peak load on hypothetical system

"Normal" line indicates peaks if war had not supervened. War increment is distance between civilian and total loads. Solid lines indicate what loads would have been if standard time had been continued and dotted lines the condition under war time.

Referring to Charts I and II, it may be of interest

to point out the similarity between the composition of the Index of Industrial Production between war and civilian requirements and that indicated by the electric load. It must be noted, however, that while the index reflects the trend in industrial production, the electric loads reflect the combined trend of the component parts of the entire load supplied by the utility.

DETERMINATION OF PROBABLE LEVELS OF POST-WAR LOADS

There are two general methods which may be used in appraising post-war load trends:

Method No. 1, which for convenience may be termed the "**Industrial Production**" method, is based primarily upon considerations of the possible levels of industrial production that may be reached in the post-war period.

Method No. 2, which may be termed the "**War Increment**" method, is based primarily upon considerations of the amount of increment load acquired during the war which may be retained after victory as part of the then existing civilian economy.

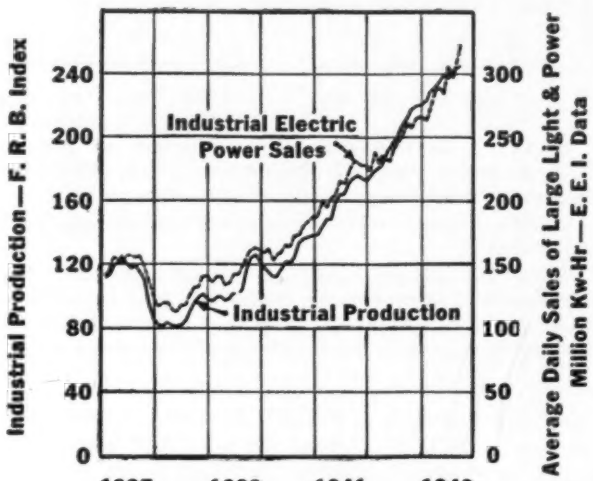

CHART III—Industrial power sales follow the industrial production index closely

Although, at first, it may appear that the general levels of post-war loads may be determined with sufficient accuracy without the knowledge or the assumption of the time when war will be over, and while this may be true for long term considerations, the timing of the end of the war will have an important bearing upon the answer sought for the immediate post-war period, which is of the greatest practical significance now. One result will be obtained if German and Japanese phases end pretty close together, and another result will be evident if they end a year or a year and a half apart. Under the former condition, the shock to the national economy and therefore to electric loads will be greater than under the latter condition. Similarly if the two wars end early in the year, the effects upon electric loads will be different from what they would be if the wars end late in the year.

For purposes of this discussion it will be assumed that the European war will be over by the middle of 1944, and that the Pacific war will end toward the end of 1945. These are not predictions but simply assumptions necessary in the proper appraisal of post-war loads.

"Industrial Production" Method No. 1

Production Index vs. Electric Power—Chart III shows a comparison between the Federal Reserve Board Index of Industrial Production (physical volume) and data prepared by the Edison Electric Institute of sales for the Large Light and Power classification, which in the main reflects electric power sales for industrial use. It should be noted, however, that these sales represent only a portion of the total electric power use in industrial establishments. It is estimated that in 1940 of the total electric power consumption in industry, more than 58 percent was represented by purchases from utilities and 42 percent was generated by industries themselves and imported by them from Canada. In 1942 these relationships were respectively 64 and 36 percent.

Notwithstanding the incompleteness of data on industrial electric power used in the chart, it will be noted that broadly speaking there was a fairly good correlation between the two series indicated in the last few years. Since, for purposes of this discussion, our interest is primarily in the behavior of electric power supplied by utility systems, the demonstrated existence of an approximate relationship between industrial sales and the index of production warrants the assumption, in so far as the hypothetical system is concerned, that within reasonable limits of accuracy, production of electric power by utilities

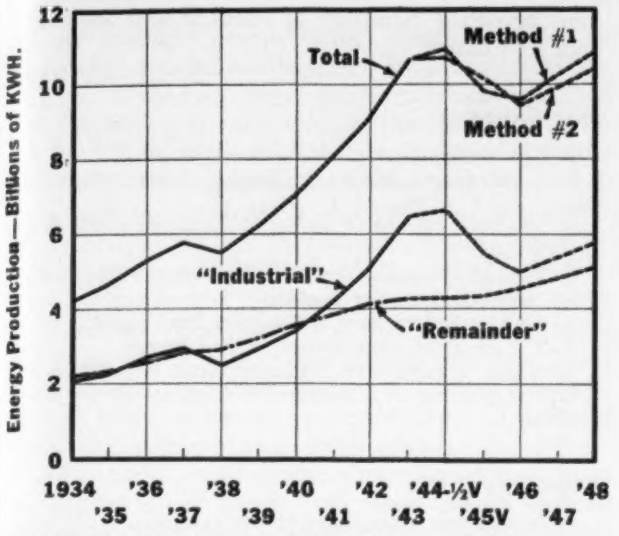

CHART IV—Electricity production of hypothetical system

for industrial use follows the broad outlines of the ebb and flow in the physical volume of industrial production. This correlation may be altered in the future, but the change will probably be gradual, affecting moderately the conditions of the immediate future with a possibility of more pronounced deviations over a long term period.

Segregation of Electric Loads—To make use of this relationship, it is necessary to resolve the load of the hypothetical system into components of "industrial" and "remainder." Although in practice further subdivisions may be justified for both of these components, for simplicity of presentation this discussion will deal with only the two major components.

Chart IV shows the total energy production of the hypothetical system and its two major components of "industrial" and "remainder." It should be noted that each of these components contains its share of the total system losses and unaccounted-for energy, so that each represents values at the point of production rather than at the point of utilization and is thus consistent with the values shown for the total system output. Generally this segregation of total system output for past years can be accomplished from system records with additional engineering studies for determining the energy losses applicable to the various classes of service.

The segregation of the system peak load, however, is not as simple, and ordinarily requires extensive research into class-of-service load characteristics to determine the load contribution of each class to the system total peak load. Chart V shows the peak loads at end of year for the hypothetical system. The 1939, 1940 and 1941 peaks are resolved into the two components of "industrial" and "remainder," based on data obtained from results of extensive research into load characteristics of various classes of service. Peak loads for prior years are not resolved into the two components because of lack of information, and no segregation is made for the "war" years of 1942–1944 inclusive, because of the change in the time occurrence of the system peaks during these years from the evening period occurring prior to 1942 to the morning period during the war so long as "War Time" remains in force. Since the contribution of component loads to the morning peak is different from the contribution to the evening peak, an indication of these values on the chart may be more confusing than helpful for the purpose of this paper. It should be noted that up to 1941 inclusive, peak loads shown occurred in the evening period. For the "war" years of 1942–1944, they are expected to occur in the morning under conditions of "War Time," and after victory they are expected to revert again to the evening period.

Generally in determining future trends, separate estimates should be made of peak loads at end of years and of annual energy production, since the former reflects the maximum rate of energy production at the specified time, the latter the total quantity of energy produced for the entire year, and under abnormal behavior of loads these quantities may bear very little relation to each other as established by past experience.

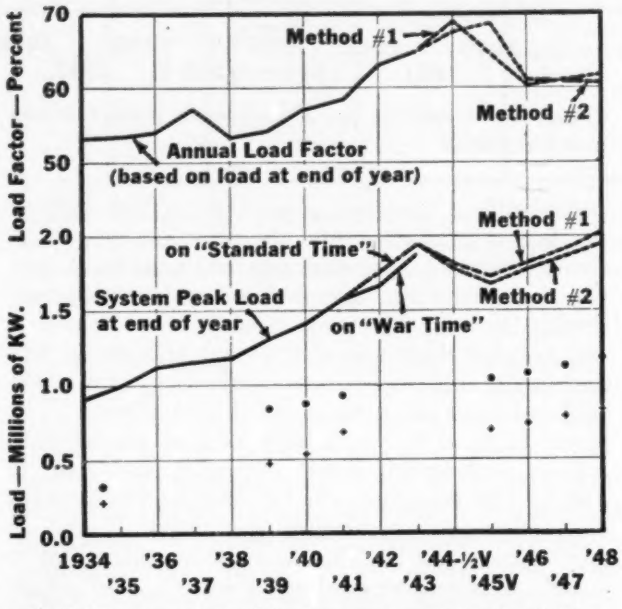

CHART V—Annual load factors and peak loads of hypothetical system

The dots ("Remainder" load at time of system peak) and crosses ("Industrial" load at time of system peak) refer to Method No. 1

Desirable Post-War Goals—Students of post-war problems express the thought that in the first year after complete victory, business should strive to

gear the national production to an employment level of between 55 and 58 million people, including those who will be retained in the expanded armed forces after the war. The average monthly employment in the last half of 1940 was 47 million people excluding those in the armed services, which at that time did not represent a very substantial amount, and the total number of unemployed at that time was about 7½ millions of people. Considering the amount of unemployed in 1940, the normal

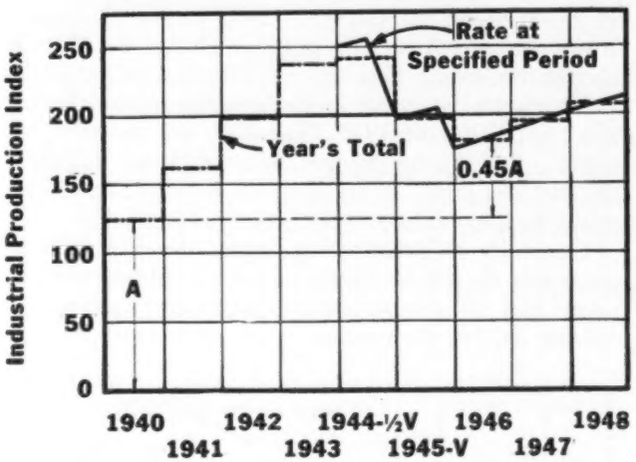

CHART VI—Industrial production index projected into post-war period

net growth in the working population from 1940 to the first year after victory, the probable war casualties in excess of normal deaths and disabilities, and the desire of some who first entered employment during the war to remain at work after victory, it appears that the upper level sought approaches well within the full employment mark, except for a normal and irreducible minimum of unemployed. The lower limit represents a high level of employment with a considerably lower unemployment than in 1940. The desirable post-war level of employment thus represents an increase of between 17 and 23 percent over the 1940 level. It is estimated that to sustain this employment after victory, and taking into consideration the increased productivity of industry accomplished during the intervening years, the level of industrial production in the year following victory would have to be from 40 to 50 percent higher than in 1940. These are goals sought by business as expressed by the Committee for Economic Development. They are considered to be desirable levels of business activity in the post-war period by most students of post-war planning in and out of government. But they may be higher than feasible in practice.

In gauging the feasibility of these results, it may be well to consider some of the plus and minus factors of major significance that will affect these levels. Stuart Chase summarized these factors at a recent meeting of the Academy of Political and Social Science as follows:

Plus Factors:

1. The pent-up demand of consumers for goods.
2. A wide-spread demand for housing, deferred during the war.
3. The large amount of savings in the hands of the public on "D" day.
4. The new materials—plastics, synthetics, light metals, which may stimulate new markets.
5. The demand for food and supplies from abroad.
6. The return of many women to their homes.
7. A grim demand from the armed forces for work or else.
8. The policing of vanquished nations so far as this is necessary.

Minus Factors:

1. A wholesale cancellation of war contracts.
2. The menace to the market of high stock piles.
3. The discharge of emergency workers in government service, said to be 1,600,000 of them.
4. Mass discharges of workers from war boom industries like aircraft and shipbuilding.
5. The retooling period in various industries when only a few skilled machinists are needed.
6. The increase in mechanical efficiency requiring fewer workers per units of output.
7. The uncertainties of international trade.
8. The psychology of fear which may seize war boom towns like Detroit, Seattle, Bridgeport. If large numbers of people become afraid, the fear of depression can bring depression.

Estimate of Post-War Power Requirements—For purposes of this discussion, the level of electric loads will be evaluated for the desirable levels of production and employment, and for ease of presentation, it will be assumed that this level of production in 1946, the first year after complete victory, will be 45 percent higher than was actually obtained in 1940. This again is not a prediction but an assumption necessary for obtaining an idea of post-war loads. To complete the picture for the intervening years, we shall accept the opinion generally held that after the completion of the German war, in the middle of 1944, the increment due to war production to that time since the end of 1940 will be cut in half, and after completion of the Japanese war, in the latter part of 1945, the remaining amount will be cut in half again, and retained at that level for an indefinite period of time for national security reasons, and to take care of the needs of an expanded army and navy over the pre-war levels.

Under these assumptions it is possible to construct the resulting index of industrial production for the year 1944-½V, (half Victory) 1945-V, (full Victory) and 1946. It can then be extended to the following years on the basis of its normal growth in the pre-war period. The results of these estimates are shown on Chart VI.

Referring to the close correlation demonstrated on Chart III between the index of industrial production and industrial power sales, it will be assumed

for all practical purposes, that a major change in the index will be accompanied by a corresponding change in electric power production for industrial use. Applying this reasoning to the results shown on Chart VI, it is possible to estimate the industrial electric power requirements in the post-war period.

A separate estimate is also made of the power requirements for the "remainder" load, Charts IV and V, from considerations of its normal growth in the pre-war period, artificial gains in it with abandonment of "War Time" and dimouts, and losses in it which will be experienced due to cessation of war activities in such classifications as camps, cantonments, and a reduction in requirements in traffic of electrified railroads and street railways.

The results of all of these estimates for purposes of illustration of the general trends which may be expected under these assumptions are shown by dash lines marked Method No. 1 on these two charts.

"War Increment" Method No. 2

Fundamentally this method is based upon an analysis of the total increment in the load obtained from 1940 (normal) to 1944 with war on. The total increment is then resolved into suitable classes and components which permit a determination of the amount of the load of each component that is likely to remain after complete victory. A further assumption is made that the entire pre-war load is retained, and that the normal growth experienced in the pre-war period is resumed after the reconversion period of industry from war to civilian production. In practice more detailed studies may be warranted. A similar approach may be made through careful surveys and appraisal of requirements of individual customers and general classes of service.

Chart VII shows for the hypothetical system the composition of the load increment from 1940 (normal) to the maximum reached during the war. An attempt was made to rationalize approximately how much of each component load may remain after both wars are over. Results of this appraisal indicate that for the hypothetical system about 35 percent of the total increment may be retained after complete victory. It will be noted from the chart that about 45 percent of the total retained is represented by the "miscellaneous" group, comprising gains in loads of the domestic, rural, commercial, traction, etc., classifications; another 35 percent is accounted for by major materials such as steel, ferro-alloys, aluminum, magnesium and copper, and the remainder by miscellaneous industrial comprising other materials such as zinc, gasoline and oil, synthetic rubber, calcium carbide and by the production of aircraft, ships, ordnance and explosives and by other industrial use. A further assumption is made that the prosecution of the Japanese war by itself would require at least 70 percent of the total increment or double the amount remaining after complete victory.

The accompanying table illustrates the method of procedure.

The results of estimates by this method for pur-

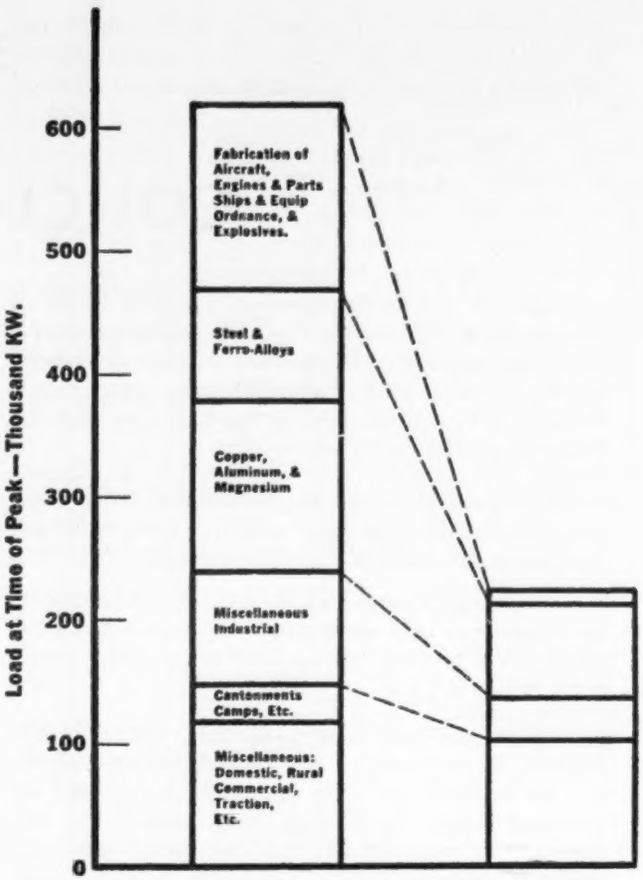

CHART VII—Analysis of behavior when war ends of load increment added by war. Left column shows total load increment since 1940 and right column what will remain of the increment after victory.

Development of Probable Post-War Loads at End of Year of Hypothetical System in Millions of Kw.

	New Load (Excl. Effects of "War Time" and Dimouts)	Probable Loads Without War	"Post-War Loads" Civilian Base	Retained Load Increment from 1940 to 1944	Annual Growth	Total Load
1940	0.04	1.36				
1941	0.22	1.45				
1942	0.39	1.54				
1943	0.59	1.64				
1944	0.61	1.74				
1944-IV			1.36	0.43	....	1.79
1945-V			1.36	0.22	0.09	1.67
1946			1.67	....	0.09	1.76
1947			1.76	....	0.09	1.85
1948			1.85	....	0.09	1.94

poses of illustration of the general trends which may be expected under the assumptions used are shown on Charts IV and V by dash lines marked Method No. 2. It will be noted that, although somewhat lower than those indicated by Method No. 1, they conform to the general trends.

CONCLUSIONS

Based on the assumptions of desirable levels of employment and industrial production used in this study for purposes of illustration, and the designated timing in the ending of the two wars, result shown on Charts IV and V lead to the following observations of interest:

1. The annual energy production may reach a low point in the first year after victory, at which time it may be in the order of 90 percent of the 1943 value.

2. The peak load at *end of* year may reach a low in the year of victory, at which time it may be in the order of 90 percent of the 1943 value under conditions of "War Time".

3. The post-war peak load may approach and exceed the estimated 1943 load at the end of the second or third year after complete victory, and the post-war energy production may exceed the estimated 1943 value in the third or fourth year after complete victory.

4. The annual load factor in the post-war period may be higher than in 1940. This will be caused in part to a natural tendency for the load factor to improve over the years which existed in the pre-war period and in part to a larger proportion of industrial energy use, with its inherently higher load factor, than in 1940 and prior years.

5. The above conclusions apply to the entire load of the hypothetical system and therefore reflect the conditions which may be obtained on its production and bulk power facilities. A somewhat different situation may be observed insofar as its distribution system is concerned. It will be noted from Chart IV that while the "industrial" energy is expected to decrease materially in the year after victory from its levels at the end of the war, the "remainder" energy, largely represented by uses of the domestic, and commercial classifications, may actually rise over the levels obtained during the war. The restoration of Standard Time after the war will have a further tendency of increasing the peak loads of these classifications above the levels under "War Time" conditions, thus creating additional requirements upon distribution facilities.

Wide Deviations

While these conclusions apply to the hypothetical system used in this paper, it should be pointed out that conditions of individual systems may deviate widely from those described herein. Other considerations show that, in general, systems which experienced a relatively small load growth during the war may develop higher post-war loads sooner than those which had relatively large load growth.

This paper has tried to bring out the high spots of electric load behavior during this war and in the immediate post-war period. The reader will probably have noticed that the important features of its behavior are not disclosed by over-all statistics. Only through a painstaking engineering analysis of the major components, or the major forces, which act upon the creation of electric loads are we able to perceive the significance of behavior of the over-all loads.

For an intelligent appraisal of future trends, over-all system load forecasts, without analytical breakdown of the components, are not conducive to either a high degree of accuracy or to creation of confidence in the validity of the forecasts. Careful research into the load characteristics of load components is fundamental to analytical load forecasting, which is the cornerstone for intelligent planning.

Regulatory Status of Co-ops

Replies from 33 commissions indicate regulation in less than a third of the states, increasing to 50 percent when non-members are served — No discrimination between members and non-members

WHAT is the regulatory status of rural electric co-operatives in the several states?

With the extension of co-op service beyond membership, either within the original service area or through purchase of private utility properties, this question is becoming increasingly important. For that reason ELECTRICAL WORLD has asked each state utility or corporation commission to state its practice. So far 33 have replied. A tabulation of those replies shows the current status.

In answer to the first question, Are these co-ops subject to the regulation of your commission? it developed that in less than a third of the replying states are rural electric co-operatives subject to regulation. In one or two cases the regulation is restricted to construction practices.

When the co-ops go beyond their own members for customers the situation changes, and in answer to the second question, Does the extension of service beyond members alter their regulatory status? the survey shows that four states that have no jurisdiction over strictly confined co-ops do undertake or will undertake to regulate co-ops when they extend service beyond members. In those cases, the commissions point out, the co-ops become public utilities.

Adding this number to those already having jurisdiction, it would appear that in approximately half the states having jurisdiction over electric utilities this regulation extends to co-ops when they serve other than members.

Where co-ops serve both members and non-members the question arose as to whether there would be any discrimination between them.

The replies were uniformly no.

Much of this field of co-op regulation is still uncharted territory. When the movement started there was an evident desire in many rural areas to encourage it and, as a result, several other states passed legislation specifically exempting co-ops from regulation as utilities. In only a few, however, did the possibility of extending service beyond members seem important. There were a few, however, that either specifically restricted co-op service to members or set up a small percentage of permissible extension to non-members.

The question has come up before in connection with co-operative telephone and water companies and the precedent exists for subjecting to regulation co-ops when they extend service to non-members. The matter is now actively before two commissions and a third is considering the advisability of bringing a test case.

State Commission	Are Co-ops Subject to Regulation?	Does Extension of Service Beyond Members Alter Their Regulatory Status?	If Regulated, Is Discrimination Allowed As Between Members and Non-Members as to Rate or Character of Service?
Alabama	No		
Arizona	Yes	Yes, it brings them under public service act	No
Arkansas	No Commission policy. Arkansas law places certain limitations	Law requires only members of co-op be served	
California	No	No	No
Colorado	No	Yes	Informal opinion "No."
Connecticut	Limited	Not allowed	
Illinois	No		
Indiana	Yes	Not allowed	
Kansas	Yes, same as any other public utility	No	Has never arisen
Kentucky	Yes	No	No
Louisiana*	No	No	No
Maine	Not over rates	Have not given territory to co-ops where central station companies were in position to serve	
Maryland	Yes	No	No
Massachusetts	No, none in state		
Minnesota	No regulation over electric service		
Montana	No	No	No
Nebraska	No co-ops, but do have public power districts subject to regulation on construction, operation and maintenance of all electric lines in rural territory including public power districts. Rates not subject to regulation. Question on service regulation	No	No
New Jersey	Yes		No
New Mexico*	No	Co-ops may supply electric energy to non-members not in excess of 10% of the number of its members	
New York*	No		
North Dakota	Yes, over safety and interference with grounded telephone lines. No, over rates and finances	This question has never come up	
Ohio	No		
Oklahoma*	No	No	
Oregon*	Strictly co-ops exempt	Yes, they become public utilities subject to regulations	No
Pennsylvania*	Not as to rates or service in preempted territory	No	No
South Dakota	No regulation over electric service		
Texas	No regulation over electric service		
Utah	No	Has never arisen	
Vermont	No	Do not know of any such cases	
Virginia	Yes, same as other utilities	No	No
Washington	No	Yes	No
Wisconsin*	No	Yes	No
Wyoming	Yes	No	No

*Specific legislation exempting rural co-operatives from regulation.

Editorials

S. B. WILLIAMS, *Editor*

Young at Seventy

IN THE MASTHEAD on the table of contents page of this issue a change has been made. Where during all last year it said "Read by electrical men for 69 years," it now reads 70 years.

Seventy years is longer than the average span of human life and is the time for most men when their days of active participation in the hurly-burly of business life are over and they retire to a well-earned rest. The same is not true of a magazine.

The members of the staff of ELECTRICAL WORLD cannot vision its age because to them the magazine is ageless. They are proud of the great part it has been the magazine's privilege to play in the development of the electrical art and industry and they take great pleasure in hearing from subscribers who have been regular readers for more than a quarter of a century and occasionally approaching the half-century mark. But their real interest lies not in what ELECTRICAL WORLD has been so much as in what it is and will be.

In a field that has changed and is changing as fast as the electrical, a magazine to serve properly must change. As we look back through the volumes for seventy years that is the thing that strikes us most vividly—change. And that is our secret of eternal youth.

Many a magazine has folded and gone the way of all flesh because it refused to adjust itself to new and changing conditions. There has been but one formula for ELECTRICAL WORLD in all its seventy years and that is to keep abreast of what is going on. Such a policy demands close attention to change—it feeds on change.

And while the contents of the magazine are changing to conform to the art, the packaging of the contents in type and illustration also change. Sometimes to subscribers of long standing this may not be appreciated because they have become so accustomed to seeing things in a certain place and presented in a certain way. But the reading habits of people change and to stay young we must change with them.

However, we make this promise to our readers, that we will make no important changes in their magazine without first discussing it with them. This is but another evidence of our policy of being modern. Just as manufacturers depend upon research to guide them in making changes in product and design, so we are being guided by a regular and continuing program of editorial research.

We hope as we enter our seventy-first year that we may ever be young and merit the continuing confidence of the electrical industry.

"Our Cause Is the Cause of All Mankind"

TWO HUNDRED and thirty-eight years ago this month America's first electrical technician was born—Benjamin Franklin. His great experiment with a key and a kite, whence came the knowledge that lightning was electricity, will continue to be the incident relating to electricity most widely known. But it is not for his contributions to electrical knowledge in those days when America was not a nation, but a group of colonies belonging to England and to France, that we bring attention to Franklin on this odd anniversary of his birth.

This year we commemorate Franklin's birth because he was the first to utter the basic political philosophy of this country, the thing that guides us in this war and was the principle of our first war and our war with Spain. As he stated it during the Revolution, ". . . our cause is the cause of all mankind, and that we are fighting for their liberty in defending our own."

This war will be worth to Americans all that it has cost if we have learned the lesson of Franklin. During the depression we came near to losing it, so eager were we to give up our freedom for security. When a people cease to want freedom enough to go hungry for it, then that people is close to losing its place among the great. America became great because the philosophy of Franklin fired men's souls and gave them the right incentive.

Today we are fighting a bigger battle than the American Revolution in terms of men and money, but the fundamentals of our championship of "the cause of all mankind" which will make us victorious in this present struggle was then laid.

Scrubbing Floors Gets Pretty Tiresome

A PROMINENT utility executive suggested recently that manufacturers might find a good market after the war is over for electric machines to wash floors, to wash windows and to clean and polish silver. He had been pinch-hitting for a maid.

This man is but one of thousands of well-to-do husbands who are getting a lesson in these helpless days in the drudgeries of housework. What effect will this lesson have on the post-war sales resistance? Plenty.

The particular electric appliances which this one man wanted won't be the same as those demanded by some

Index Available

Because of paper shortage, ELECTRICAL WORLD's semi-annual index, which ordinarily would be included in the last issue in December, is being printed separately and will be available shortly. It may be obtained by subscribers without charge on request. Address Editor, ELECTRICAL WORLD, 330 West 42d Street, New York 18, New York.

other be-aproned executive. The crop of men to whom could be sold dishwashers right now is perhaps bigger than anything else. Yet when the maids come back to work, much of this will die down. There will remain, however, a lasting impression of the value of these household devices, and for a time at least it may be well to include this "maid-of-war" in all promotional plans.

Legal Interference in Rate Making

TWO YEARS AGO the Supreme Court served notice that rate regulation was a matter for the decision of properly constituted commissions and that such matters should properly come before the court only when constitutional rights were in dispute. This week, in the Hope Natural Gas case, the Supreme Court reaffirmed that position by holding that unless the total effect of a rate order is unjust and unreasonable there can be no judicial inquiry.

Most rate cases that have come before the Supreme Court in the past have been based on dispute over the method of arriving at the rate base. In its 1942 decision the court in effect said, although it was not altogether recognized at the time, that it could not be bothered with a rate case every time there was a dispute as to the method of arriving at value. In order to clarify the situation the court at the time said that rate-making bodies are not bound to "the service of any single formulas or combination of formulae." This was taken at the time to mean that the prudent investment theory was given the green light and that reproduction now was dead. That may be the practical effect of that decision, but this week's decision makes it clear that what the court actually meant was that valuation was a job for experts and that they could arrive at their decisions any way they wanted to provided the final result was not unjust or unreasonable. This is clearly shown in the statement following the decision that judicial inquiry was at an end provided the effect of the order was not unjust or unreasonable in these words: "The fact that the method employed to reach that result may contain infirmities is not then important."

Instead of clarifying the status of rate making the present decision is likely to have the opposite effect because virtually all rate decisions can be challenged on the grounds that they are unjust and unreasonable. What constitutes "unjust and unreasonable?" Companies cannot be left to the tender mercies of politically appointed bodies in the final determination of their economic rights. The supreme court still has the final determination of utility rates in its lap and will have it so long as "due process" continues to be the law of the land.

The Small Business Man's Post-War Friend

THE FATE of the small businesses after the war is worrying the Secretary of Commerce. He sees the larger companies actively laying plans for the period after the war, but he asks, in the January issue of *Domestic Commerce*, "What of the thousands of smaller business firms without any affiliation with groups and lacking adequate managerial skill to plan for their future?"

This is a problem that is not only worrying Jesse Jones but a lot of other people as well, principal among whom are the utility companies.

Mr. Jones pointed out that there are some 2,750,000 individual concerns in the United States with a normal payroll of over eight million people. We might point out that these concerns are customers and the workers and their families are customers of the power companies. Besides, the people who supply these concerns and these workers are customers. Obviously, anything that affects the economic position of this great group of customers is of great concern to the utilities.

When this country began to build its national defense it was apparent that some way had to be found whereby the smaller concerns could participate in the defense orders. Washington recognized the problem and set up a small plant organization to effect just such participation, but the real work had to be done in the field. If the record could be printed it would be evident that much of whatever success the government has had in getting defense and war contracts into small factories was due to the untiring efforts of power salesmen. They even left the utility employ to go on the government payroll in order to speed up small-plant conversion.

And now that the signs point to an ending of the war before long there is the next problem of getting these same concerns back into peacetime business, only in this case reconversion isn't going to be as easy as conversion.

Some power companies have been working on this problem for some time, for in many respects it is the most important post-war problem that they have. In addition to their own individual plans is their work on the Committee for Economic Development. They see the problem clearly, and it can now be prophesied that whatever external help the small manufacturer gets will in no small measure be due to the active interest the power companies have in his economic well-being.

Washington Comment

By R. N. Larkin, Washington Correspondent

Excess Inventory on Its Last Lap

MANDATORY redistribution of electric utility inventory by the Office of War Utilities is headed down its last lap. While OWU's Inventory Control Branch is not yet headed for the scrap pile, much of its future job will emphasize new considerations.

As the situation now stands, electric utility inventory of 228 systems representing 95 percent of all excess inventory has been reduced by about $25,000,000 under the OWU redistribution program. This reduction totaled $20,000,000 at the end of the first six months under the plan. Since then about $5,000,000 more has been moved, leaving approximately $152,000,000 worth of material in electric inventory. Of this amount $112,000,000 is in Practical Working Minimum inventory, not subject to the redistribution program, and about $40,000,000 remains to be distributed. Since about half of this amount is considered presently undistributable, it is apparent that the Inventory Control Branch has come within striking distance of having worked itself out of a job. Peak of electric utility inventory was reached June 30, 1942, when material, exclusive of fuel, valued at $179,000,000 was on hand.

U-1 Relaxation

Since U-1 and other orders are responsible for the fact that much of this excess does not now stand to be moved, it is immediately apparent that relaxation of U-1 would allow more or less of this frozen stock to be put into use. To what extent these restrictions will be eased as the war draws closer to its end remains to be seen. Obviously U-1 will be further relaxed. To the extent that it is eased, the existing mass of excess inventory will be chipped away from the bottom.

Two new factors will tend to compress the existing excess from the top. One is the utility rehabilitation program in reconquered countries, which is as yet almost totally undefined. The other, which may or may not be of consequence, is OWU's program to build up inventories of Pacific Coast systems against the day when the nation will wheel westward to beat down the Japanese in real earnest.

Foreign Rehabilitation

No layman, of course, can predict today to what extent excess inventory will be drained off by the rehabilitation program. It has not yet been decided on what standards we will rehabilitate utility service in liberated areas. Indeed, the extent to which such service will require rehabilitation is not yet apparent, for we have driven the Germans only from the barest fringe of Europe, and it is not until the enemy is driven from a city that we can determine the damage he has wrought upon its utilities. Apparently the Army did a remarkable job in restoring electric service in Naples within a relatively short time, but the amount of material which was required to do this is unknown to the public.

About the only definite information on this matter which is available today is that there is considerable material in excess inventories—large-size bare and weatherproof wire, underground cable, meters of limited application and switching and substation equipment—which does not stand to move under existing U-1 restrictions. This material could be shipped abroad before orders for it could be filled by manufacturers; thus it unquestionably will be used if any such material be needed.

Neither is it yet clear how much will be moved to West Coast utilities. Thus far there has been relatively little response by these companies to OWU's recent suggestion that they review their inventory needs, particularly with reference to housing and MRO items, so as to prepare for whatever additional rush may be provoked by the turnaround to face Japan. A compelling angle in OWU's thinking is the likelihood that when the turnaround comes rail shipping west will be swamped. OWU figures that electric equipment shipped west today will not compete for rail space with more direct war material moving west when the final assault on Japan is being mounted. It will grant specific authority to exceed the provisions of U-1 to those Pacific companies which seek it in compliance with the preparation program. Regional utility engineers will shunt West Coast requests for items on Schedule B of the new U-1 (formerly Schedule C) to those utilities listing the needed items in excess, and the over-all total of excess inventory will thus be reduced.

Utility Construction

Excess inventory could also be moved by more aggressive action by utilities themselves. Realistic scrapping programs and attempts by utilities to promote sales, rather than merely accept them, would help. Utilities also might receive favorable action by OWU on appeals for permission to exceed provisions of U-1 where they could use excess stocks in plant rehabilitation.

Of course, remaining excess inventory could be wiped out by the stroke of a pen. U-1 could be amended to drop restrictions on inventory or a new formula inserted therein which would wipe out the $40,000,000 worth of excess by including it in PWM. Such paperwork, however, would not settle the problem posed by the existence of large stocks of goods ready for use, representing large quantities of scarce materials, manpower and manufacturing capacity.

While it is conceivable that the allowable PWM will be revised upward to care for thorough-going plant maintenance or limited capital additions during the war, no purpose would be served by abolishing the opportunity to use existing inventory by inserting into U-1 a new formula which would wipe out excess inventory. Materials, manpower and manufacturing capacity are not yet that easy, nor are they apt to be so considered during the war.

NEWS OF THE WEEK

Federal Power Commission Sustained in Decision

Supreme Court refuses to put any limitations on regulatory bodies in determining utility rates — Five-to-three decision upholds FPC's contention on prudent investment basis

The Supreme Court this week refused to put any limitations on regulatory bodies in determination of utility rates other than that the final result should be just and reasonable. In a five-to-three decision the court upheld the Federal Power Commission in its allowance of 6½ percent return upon a 33-million-dollar rate base arrived at on the prudent investment basis. The company contended and was upheld in the Circuit Court of Appeals for a valuation of 66 million dollars based upon the cost to reproduce at present prices.

Douglas Writes Decision

The majority decision, written by Justice William O. Douglas, refused to hold either for or against the prudent investment or any other theory of valuation, declaring that "it is not the theory but the impact of a rate order which counts. If the total effect of the rate order cannot be said to be unjust and unreasonable judicial inquiry under the act [Natural Gas] is at an end."

In a strong dissent from majority opinion, Justice Jackson argued that if the Supreme Court were to hold a rate reasonable merely because FPC considered it to be so, legal review "becomes a costly, time-consuming pageant of no practical value to anyone." Justices Frankfurter and Reed also dissented.

Many comments have been heard expressing disappointment that the court did not rule specifically on prudent investment versus reproduction cost when arriving at value, as had the Circuit Court of Appeals. In handing down its decision the majority recalled its decision two years ago in the Natural Gas Pipeline case, in which the court broke for the first time from its long-standing fair value theory of "*Smyth vs. Ames*" that all elements of value had to be considered, and held that rate-making bodies were not "bound to the service of any single formula or combination of formulas."

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Says Investigation "Is Long Overdue"

Commenting on the Senate investigation of the Rural Electrification Administration in a letter to Senator Henrik Shipstead (Minnesota, Rep.) dated October 12, the Minnesota Municipal Utilities Association expressed the conviction that this investigation "is long overdue."

The letter, which was recently released to ELECTRICAL WORLD, puts the association on record as strongly opposed to the REA generating plant program, which was characterized as conducive of waste and extravagance and which, the letter states, has been the subject of numerous protests on the part of our association and our members.

"We simply desire," the association letter states, "to emphasize the fact that, in spite of these protests and continued evidence and proof of the unsoundness of such a (generating plant) policy as the REA has carried out, this program of waste and extravagance has continued unabated, and but for the war would at the present moment be going ahead on a broader scale than ever."

More Plans Anticipated

"Reports reach us continually," the letter to Senator Shipstead continued, "of plans which the REA has in mind for building more power plants and more transmission lines, all unnecessary and all representing a needless expenditure of public funds with no advantage whatsoever. On the contrary, their prospective plants will increase the cost of electric service to these various co-operatives, as has been conclusively proved by studies and by their own operating records."

The letter, signed by Lee M. Nelson, secretary-treasurer of the Minnesota Municipal Utilities Association, further asserts:

"This association feels that, among other things, your investigation will result in positive action such as will prevent the continuation of this program of waste of public money and the diverting of funds which should go to bringing electricity to the farmers (at the lowest possible cost) to other purposes which in no way contribute to the success of rural electrification."

Further Testimony

There was put into the record of the committee this week further testimony of Ward B. Freeman, former chief engineer for REA, relating to conductor specifications for three co-op projects in Indiana, Tennessee and Iowa.

Wilson Warns Public of Production Cuts

Cutbacks in war production will be numerous during 1944, but where war production shrinks, it will be offset by a gain in another product, WPB Vice-Chairman Charles E. Wilson warned the public last week.

In a limited way, Wilson asserted, certain war production may slacken sufficiently to allow for the limited production of civilian goods. General production of such articles, he warned, remains "far, far down the list." WPB's outlook for the year Wilson characterized as providing war needs first, then bedrock civilian needs to maintain health, sanitation, transportation and other services which will enable war workers to perform at top efficiency. Thereafter, as much civilian production as can be engaged in without interference with war production will be undertaken.

On the heels of this delineation of policy, WPB announced approval of programs to make 2,000,000 electric irons and 50,000 cast-iron bath tubs during 1944. The latter will not be available for civilian purchase, being allocated for housing projects. The irons will be on sale, unrationed, in about six months. Approval of this program was based on the fact that relatively small amounts of material are needed and that the principal manpower need is in assembly.

Manufacturers will be allowed to accept or reject quotas amounting to 43 percent of their 1940 production. Those who accept will be surveyed by WPB, which will consult both military authorities and the War Manpower Commission to assure that no production interferes with a war program. Manufacturers who are not permitted to manufacture irons may have their quotas made for them by other makers. Distribution will be on the basis of 1940 distribution, but exceptions to take care of war emigration will be made.

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Danville Water Potential Reaches Dangerous Stage

A further steady failing of the city's turbines, which produce electric power in Danville, Va., was reported last week. The Talbott reservoir is now 60 ft. below the spillway and not over 20 percent of the water potential is left. The city is preparing to put the steam plant into operation, unless rain replenishes the reservoir.

NEWS BRIEFS

AMERICAN FIGHTING MEN all around the world wrote the copy for the newest General Electric institutional advertisement. The boys, all former employees of the company, had written home to tell of their reaction when they bumped into the familiar G.E. trademark on ships, planes, radios, guns and tanks they were operating. Excerpts from these letters were combined to be carried into an ad which will go into 146 daily newsapers from coast to coast.

THE DUKE POWER CO. recently presented to R. S. Cannon a diamond-studded company emblem honoring him as its first employee to complete forty

years of service with the Duke utility. Cannon (seen at left) is superintendent of Duke Power Co.'s Catawba hydro-electric station. C. I. Burkholder (seen at right) vice-president of the company, made the presentation. Mr. Burkholder has been with the Duke company 37 years himself.

IN A MUNICIPAL ELECTION held recently in Dallas an amended franchise was voted for the Dallas Power & Light Co. which will bring refunds totaling $725,000 to consumers for 1943 and lower rates in the future. Also approved was permission to issue $15,000,000 worth of bonds to finance post-war improvements.

MANY SHREVEPORT, LA., HOMES were without electric lights on Christmas night as crews worked to repair damage to wires caused by ice on Christmas Eve. Between 3,500 and 5,000 trouble calls were received by the Southwestern Gas & Electric Co. Damage to the wires was estimated at $15,000. Large crews of repairmen, some called from Marshall, Longview and Mount Pleasant, worked late into the night to repair the damage.

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Prospect of Material Brighter for Industry

Electric utilities and equipment manufacturers start 1944 with considerably brighter prospects of obtaining materials than they had in early days of 1943.

Most notable relaxation on materials during the year was the institution of and later amendment of numerous orders supplementary to U-1. While all the orders which were written during the year were written primarily to relieve the burden of paperwork on utilities, OWU and its regional offices, the fact that any blanket authorization of extensions was permitted indicated an easier materials situation than prevailed throughout 1942 and early 1943. Later amendments of these orders, culminated by the wholesale December 10 changes, pictured an even better materials situation.

While aluminum, which in early war days was the tightest of all common metals, became easier well before copper, OWU officials emphasized that for purposes of line extensions under orders supplementary to U-1, both metals are equally available today. This is borne out by the wording of supplementary orders U-1-C and U-1-F, which were most drastically amended December 10. Under each order extensions may be of any type or size conductor purchased from a commercial supplier whose conductivity is equal to or less than No. 6 AWG copper, or any type or size conductor available in excess inventory. OWU makes no recommendation as between aluminum steel or copper conductor. This applies not only to extensions under supplementary orders but to those requiring specific permission as well.

Other notable relaxations of materials during 1943 include the amendment of Order M-i-I to allow the use of aluminum for electrical busbars, bare conductor and current-carrying accessories, as well as switchgear and the amendment of Schedule 4 of Order L-154 permitting the manufacture of fuse links with any time-current characteristic previously used by the manufacturer instead of only one time-current characteristic.

One growing material shortage, that of malleable iron castings, has led OWU to look more leniently upon applications for authorization to use bronze castings, which once were among the tightest materials.

Expect Decision Soon on Coal Order No. 10

Solid Fuels Administration's Order No. 10 establishing coal quotas for various classes of users expected this week — No advance indication by Ickes toward easing of order

The future of the Solid Fuels Administration's Order No. 10—establishing the quotas of coal available for various classes of users (ELECTRICAL WORLD, November 20, 1943, page 3)—was to be decided this week at a meeting of SFA regional directors in Washington. In issuing the order SFA promised a review at the end of the first month's operation under it to determine whether allowable days' supply for utilities could be raised.

No Advance Comment

While there was no advance comment from SFA on the possibilities of an increase in the amount of coal utilities may have on hand before their purchases are restricted to a percentage of their monthly burn, there has been nothing in any statement by Solid Fuels Administrator Harold Ickes during December which would indicate any SFA thinking toward an easing of the standards governing utility coal purchases. Ickes' public pronouncements since taking over the coal situation have been only one long prediction of incipient disaster. While more bituminous coal is coming out of the ground under the strike settlement negotiated by Ickes, anthracite production has been dropping steadily, and increasing amounts of bituminous have had to be diverted east to fill in for missing anthracite. Ickes recently halted until spring all shipments of anthracite west of Pennsylvania.

Despite a few indications that SFA might, on general principles, attempt to lower even further the allowable number of days' supply for electric utilities, it was expected that the Office of War Utilities officials would protest any such move vigorously. OWU's Fuel and Allocations branch completed a limited spot-check among utilities recently which showed that although utilities hold a preferred position in coal allocation, many companies have not been able to buy all the coal to which they are entitled simply because there was no coal to be had. Fewer SFA directives, requisitioning for another user coal originally scheduled for utilities, have been served on electric companies since Order No. 10 went into effect, but in return, fewer directives furnishing emergency coal to utilities have been issued.

Meanwhile, utilities which have been unable to buy all the coal to which Order No. 10 entitles them have had to draw even more heavily on their stockpiles than had been anticipated, bringing them nearer the time when their supplies get down to or below the allowable levels, and thus nearer the time they will be purchasing their full monthly burn or more coal monthly.

One WPB official described the directive system, which he said SFA had "honestly tried to minimize," as "robbing Peter to pay Paul—they hope." He pictured the coal situation as so tight that when a load of coal was requisitioned away from one buyer to fill the emergency needs of another user, a sort of endless chain of replacement directives was started until SFA encountered one user who could stand to lose a load without replacement. These users are scarce these days, the official added.

WPB statistics show that electric utilities received more coal than they burned during only four of the months between January and November, 1943, inclusive. In all but March, April, May and August utilities burned more than they received, pulling industry stockpiles down from 20,000,000 tons to about 17,000,000 tons December 1. November coal shipments to utilities totaled only about 75 percent of that month's burn, a bigger one-month loss than the total of the four months' surplus. Most of the 4,000,000-ton drawdown in utility stockpiles during the first eleven months of 1943, the figures show, took place in October and November, with a deficit of 1.9 million tons in November.

While there was little definite on the question of continued fuel oil consumption by electric utilities in the 17 Atlantic Coast states, there are indications that some curtailment of this program may be necessary within several weeks, in which case an added burden would be thrown on utility coal supplies.

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C.E.D. Enlists Experts for Post-war Planning

Outstanding experts in manufacturing, marketing, sales, finance, management and engineering have organized to make available to American business during 1944 the latest practical knowledge needed to help them effect an expansion of post-war production and employment to unprecedented peace-

THANKS A MILLION—Mrs. John Kenworthy of Taunton, Mass., receives congratulations from the members of the municipal electric light department on bringing the annual receipts to $1,000,000 for the first time in Taunton history by payment of her regular service bill. Plant output this year will be about 57,000,000 kw.-hr. compared with about 19,000,000 kw.-hr. a decade ago. There are now 12,000 customers, the city population being 38,000. L. to r., Chairman W. K. Hodgman, Jr.; manager, Chester F. Buckley; Mrs. Kenworthy and Commissioners Walter H. Barker and Manuel B. Silva

time levels, it was announced last week by Marion B. Folson, chairman of the Field Development Division of the C.E.D.

Eleven action and advisory committees, Mr. Folson said, will make this knowledge freely available to all American businessmen in publications and by direct consultation through the 1,100 community committees of C.E.D. now at work in the 48 states.

"The most pressing job of the CED in 1943," said C. Scott Fletcher, director of the Field Development Division, "was to organize businessmen at the community level to study conditions in their own localities and in their own businesses and to take responsibility for devising bold plans for reducing post-war unemployment to the bedrock minimum. On New Year's Day, 1943, we had exactly three pins in our organizational map. Today we have more than 1,300, representing regional, state, district and community committees, and more are being inserted every week."

"Our Research Division advises us that 55,000,000 post-war civilian jobs in business, agriculture and government, producing $142 billion of goods and services, is a reasonable and achievable goal. Compare that with 46,000,000 and $97 billion in 1940—our banner peacetime year hitherto—and one can appreciate the size of the job which confronts America in the post-war period," Mr. Fletcher continued.

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Short Circuit Causes Power Interruption

A short circuit occurring on the 11-kv. bus recently at hydro-generating station No. 5 of the Rochester Gas & Electric Corp., Rochester, N. Y., resulted in a four-hour interruption of service to the northern section of the city and its suburbs. Some industrial customers were also affected.

About 8 p.m. the operator was removing a generator from service, when the oil switch of the unit failed to latch open and continued to close and open several times. This faulty operation continued until the switch was broken down, causing a short circuit. Several adjacent switches were affected and it became necessary to clear the entire bus. The faulty operation of the oil switch was found to have been caused by the fracture of a small pin in the operating mechanism.

Damaged sections were isolated and full service restored shortly after 1 a.m. The damage was estimated to be approximately $35,000. There were no personal casualties.

Electric Industry Gets Manpower Suggestions

OWU Director J. A. Krug forwards recommendations to the industry in administrative letter this week — Extension of working week, training programs and replacement schedules suggested

Extension of the working week, employment of additional women, operation of training programs and the use of replacement schedules have been recommended to the electric utility industry as the best means of keeping sufficient trained employees and of indicating to federal manpower agencies that it is interested in co-operating with wartime labor programs.

Recommendations Sent

The recommendations were forwarded to the industry this week in an administrative letter from Director J. A. Krug of the Office of War Utilities and were based on conversations with utility representatives and findings of a utility manpower poll conducted by the Edison Electric Institute.

E. E. I. findings and system representatives agreed that the manpower situation is not yet generally critical, but agreed also that the trend is toward more difficulties in keeping sufficient and competent labor. About 15 percent of utilities reporting to E.E.I. (in terms of employees) consider the situation critical now, but 35 percent, on the same basis, expect critical conditions in March and another 45 percent expect them by September. Reported existing critical conditions are not now centered in any area of the country, but seem more prevalent among small systems than in large companies.

Of the 35 percent of all employees which the industry has lost since December 1, 1941, about 20 percent have been lost to other industries, while 15 percent went to the armed services. About 25 percent of the existing labor force is draftable.

Representatives of utilities which use replacement schedules approved the results obtainable therefrom, but the E. E. I. survey showed that only about half the reporting companies use them. Krug pointed out that draft boards are less likely to take men before their replacements are ready when replacement schedules are in use, and suggested that their use would constitute evidence that the company in question was interested in solving the manpower problem properly.

While about two-thirds of reporting companies have formal training programs in operation, Krug warned that "it appears that training must be intensified if utilities are to maintain sufficient operating forces." Training is particularly necessary because of the long experience required for many utility jobs, and constitutes evidence of orderly handling of the manpower problem which is apt to win consideration from draft boards and federal recruitment agencies.

While there are many other, better-paying job open to women and the lengthy training period offers no attraction, utilities should investigate every possibility of employing even more women, and in jobs outside the clerical and building service occupations in which they have customarily been used. In almost every instance, Krug said, reporting utilities have found women satisfactory.

On 40-Hour Week

Half the reporting utilities still work employees only 40 hours weekly and only 20 percent have 48-hour weeks, the E. E. I. report showed. Krug suggested longer hours, with the comment that "in general, utilities on a 48-hour basis can expect to receive greater consideration from government agencies in solving their manpower problems."

"The office of War Utilities is prepared to assist in every way possible in the manpower situation," Krug wrote, "but our investigation clearly indicates that the solution of the most immediate problems lies in your own efforts and in co-operation with manpower officials in each locality. Each electric system should make every effort to meet its problems at this level."

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Standards Data Issued

The American Standards Association of New York City announced this week the publication of its new lists of standards. The booklet includes more than 600 standards, of which 64 have been approved or revised since the last list was printed in April, 1943. The standards cover specifications for materials, methods of tests, dimensions, definitions of technical terms, procedures and other related subjects.

TVA System Second Among Power Producers

Tennessee Valley Authority moves from fifth to second place among power-producing systems at end of fiscal year — 9,056,000,000 kw.-hr. of electricity generated

The Tennessee Valley Authority moved from fifth to second place among power-producing systems in the United States during the fiscal year ended last June 30 by generating 9,056,000,000 kw.-hr. of electricity, 75 percent of which went to war uses.

Record Net Income

Net income from power operations rose to a new high of $13,148,853 under the impact of heavily increased demand and a favorable water year, the authority noted in its annual report, all of which was paid into the U. S. Treasury in amortization of its power indebtedness. Gross power revenues were $31,674,210, an increase of more than $6,250,000 over the preceding fiscal year. Municipalities and co-operatives distributing TVA power showed a gross return of $34,670,000 and net incomes totaling $5,807,000.

Average consumption per residential customer served at TVA rates rose to 1,598 kw.-hr. yearly, while the average cost per kilowatt-hour declined to 1.96 cents.

In addition to a broad contsruction program which saw two dams completed during the fiscal year and two more placed in operation shortly thereafter, TVA put new generating capacity into operation sufficiently fast to keep ahead of expanded power needs, supplied substantial stand-by power for neighboring utility systems and designed two hydroelectric systems for the Russian government under lend-lease auspices. As a result of the design of these two Russian plants, TVA was asked to report on 16 additional Russian projects, eleven of which it is now designing. A commission of Russian engineers visited the authority to work with it in the program.

New Units Installed

Additional generating units were installed at Wilson, Pickwick and Watts Bar dams and at the Watts Bar steam plant. Three 25,000-kw. machines went in at Wilson, one 36,000-kw. machine at Pickwick and one 30,000-kw. unit was installed at Watts Bar Dam. The Watts Bar steam plant was raised to an installed capacity of 180,000 kw. by installation of a 60,000-kw. steam turbine.

Dams completed were Douglas, on the French Broad River, which established a construction record of a little less than thirteen months, and Ocoee No. 3 on the Hiwassee River. Fort Loudon Dam, on the Upper Tennessee River, and Apalachia, also on the Hiwassee, were completed shortly after the close of the fiscal year.

Three upstream storage reservoirs, TVA pointed out, accounted for a considerable part of the increase of 160,000 kw. of firm capacity added to the system's potentialities during the year. A power house separated from Apalachia Dam by an 8-mile diversion tunnel, went into operation last September with the first of two 37,500-kw. generators.

Outside the electric power field, TVA's annual report showed production of huge amounts of fertilizers and chemicals for munitions production, educational programs ranging from malaria control taught army officers to improved agricultural methods taught farmers, various engineering services, including the mapping of thousands of square miles, development of new housing practices and of new methods of producing aluminum and magnesium.

FOR SAFE OPERATION—Four years of electrical operation and maintenance (467,400 man-hours) without a lost-time accident among 56 men working in the 21 steam plants and substations of the Brockton (Mass.) Edison Co. were recently marked by the presentation of a certificate of honor from the Liberty Mutual Insurance Co., Boston. Joseph P. Walsh, substation superintendent (left center) received the award on behalf of the utility from A. L. Dowden, public utilities safety engineer, insurance company

Savings Expected in Utility Fuel Supplies

Substantial savings in electric utility fuel supplies along the East Coast are expected under the cutback of pig aluminum production scheduled for this week by WPB.

With partial shutdowns already ordered at plants in New York City and Burlington, N. J., WPB's aluminum division was expected this week to order complete cessation of production at Massena, N. Y., within 30 days. As many as 15 aluminum potlines stood to be shut down under the cutback.

Fuel savings were estimated to run as high as 3,240,000 tons of coal or its equivalent yearly. It was estimated that one aluminum potline would use about 18,000 tons of coal per month. If 15 potlines are shut down, possible savings would approximate 270,000 tons of coal or its equivalent monthly. The potential yearly savings of almost 3,250,000 tons would not be far short of the amount of coal savings seen possible under the mandatory lighting curtailment program junked last summer by WPB.

It was believed that the decision to shut down plants along the East Coast was occasioned by Petroleum and Solid Fuels Administrator Harold L. Ickes' claims of possible fuel savings. Office of War Utilities representatives advised the aluminum division that as far as electric generating capacity is concerned, any section of the country in which aluminum plants are located is on condition to supply the necessary power. They pointed out, however, that there is surplus hydro capacity in at least one aluminum manufacturing area.

NRECA Postpones Annual Convention

The National Rural Electric Co-operative Association has postponed its second annual convention, which had been tentatively scheduled for the third week of this month at St. Louis. The meeting is now tentatively scheduled for March.

Travel difficulties and inability to obtain quarters during the two-day session were stated as the cause of its postponement.

Meanwhile, Avery C. Moore, NRECA secretary-treasurer and insurance manager, is expected to operate the organization from its Washington office in the absence of Executive Manager Clyde T. Ellis, who entered the Navy last week. It was believed that no acting executive manager would be appointed to replace Ellis.

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Heating by Power Held Impractical

Under climatic conditions existing in Montreal, and the Province of Quebec in general, the heating of private dwellings by electricity is neither economical nor practical under present known and proved methods. This was the conclusion that Huet Massue, M.E.I.C., statistical engineer of the Shawinigan Water & Power Co., reached in an address to the Electrical Club of Montreal on the comparative cost of heating dwellings by coal, oil, gas and electricity.

Mr. Massue said that electricity would be ideal for heating, but the factors against it were the magnitude of the power requirements, the investment needed to bring the power requirements, the investment needed to bring the power to the consumer's premises, the limited time during which the full capacity of the installation would be used, and the high cost of heating which would result.

Electric heating of private dwellings would increase the power requirements of retail customers about tenfold. In the Province of Quebec present installations provided 4,839,543 hp., whereas that needed for heating would be 8,000,000 hp. If only the dwellings in urban centers throughout Canada were heated, there would have to be produced 28,200,000 hp.

There were only three provinces in which water-power resources would be sufficient to meet heating requirements of private dwellings, Quebec, British Columbia and Manitoba.

To produce heat for private dwellings in Montreal would require seven Beauharnois plants utilizing the 82-foot head available between Lake Francis and Lake St. Louis, and containing thirteen units of 53,000 hp. each. As time went on and more and more electricity would be used for heating, it would only be auxiliary to coal, oil and gas.

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Missouri Utilities Seek To Intervene

Last week three utility companies sought to join in a Supreme Court fight in Missouri aganst entrance of the Sho-Me Power Co-operative, Columbia, Mo., into the public utility field. Permission to intervene was requested by the three utilities in a suit challenging the co-operative's authority to purchase the Missouri Electric Power Company of Springfield, Mo. The purchase would be financed by REA.

The companies seeking permission to intervene are the Missouri Utilities Co. of Cape Girardeau, the Arkansas-Missouri Power Corporation of Blytheville, Ark., and the Empire District Electric Co., of Joplin, Mo. They charged that Sho-Me is "not a bona-fide co-operative association or corporation, but is a device organized under the direction of the REA for the purpose of extending control and dominance by said REA over a substantial part of the utility plants and systems now operating in the state of Missouri."

MEETINGS

Previously Listed

Missouri Valley Electric Association—Annual power sales conference. Continental Hotel, Kansas City, Mo., January 19-20. I. D. Pettegrew, director, 1527 Sharp Bldg., Lincoln 8, Neb.

American Society of Civil Engineers—Annual meeting, Engineering Societies Building, New York, N. Y., January 19-21. George T. Seabury, secretary, 33 West 39th St., New York, N. Y.

Canadian Electrical Association—Annual winter conference of committees, Mount Royal Hotel, Montreal, Que., January 20-21. B C. Fairchild, managing director, 804 Tramways Bldg., Montreal, Que.

National Association of Purchasing Agents—Public Utility Buyers Group mid-winter conference, Edgewater Beach Hotel, Chicago, Ill., January 24-25. M. B. Covell, Chairman, Union Electric Company of Missouri, St. Louis, Mo.

American Institute of Electrical Engineers—National technical meeting, Engineering Societies Building, New York, N. Y., January 24-28. H. H. Henline, secretary, 33 West 39th Street, New York, N. Y.

Sales Executives Conference—Netherland Plaza Hotel, Cincinnati, Ohio, February 3-4. H. E. Dexter, secretary-treasurer, 50 Market Street, Poughkeepsie, N. Y.

American Society for Testing Materials—Spring meeting and committee week, Netherland Plaza Hotel, Cincinnati, Ohio, February 28-March 3. Robert J. Painter, Assistant Secretary, 260 S. Broad St., Philadelphia, Pa.

George L. Carlisle Named New Chief

George L. Carlisle is new chief of the switchgear-transformer section of the equipment production branch of the Office of War Utilities' power division. Formerly chief of the switchgear section, Carlisle replaces M. F. Mitschrich as head of the transformer section. The two sections were consolidated. F. C. Harriman, assistant chief to Carlisle, will be assistant chief of the new division.

Mitschrich will return to his pre-war position as vice-president of the Moloney Electric Co. of St. Louis.

Constantine Bary, former chief of the power forecast and special studies unit, has resigned and will serve henceforth as a consultant. William H. Phillips replaces Bary as chief of the unit.

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Electrical Union Seeks Wage Increase

United Electrical, Radio and Machine Workers' Union, a CIO affiliate, is seeking a 17-cent-an-hour wage increase for 100,000 members it claims are employed in 45 General Electric Co. plants, a spokesman for the union said last week.

Edward G. Wallingford, president of the union's Local 301, said that the UERMW also asks a monthly adjustable bonus based on the cost of living. Its requests, he added, were made in annual wage negotiations which cover a period of several weeks. Company spokesmen declined comment.

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Annual Report Forms Omit 1943 Schedules

FPC announced last week its transmittal of a letter to the executives of the nation's major electric utilities advising that 36 schedules need not be prepared for the annual report form (FPC Form No. 1) to be submitted by such utilities covering the year 1943. The commission also modified its 1943 reporting requirements with respect to two other schedules in the report.

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OPA Grants Coal Increase

A 5-cent increase per net ton in their ceiling prices was granted most Indiana producers of bituminous coal last week as OPA recognition of recent added labor costs. Only those producers operating mines in which all loading is by hand were excluded from the boost.

Output in Slight New Year Rise

The output curve started again on the rise for the week which ended New Year's Day, January 1, 1944, according to estimated figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power industry during the week came to an estimated total of 4,300,000,000 kw.-hr., as compared to the actual figure of 4,295,010,000 kw.-hr. for the week previous, which ended on Christmas Day. Figures for the week, however, represented an increase of an estimated 13.8 percent over the 3,779,993,000 kw.-hr. distributed during the corresponding week a year ago. Figures for the corresponding week two years ago were even lower, the total being only 3,288,685,000 kw.-hr. for that period.

Again no official figures were available from the country's seven major geographic regions, but it is presumed that all remained steady, with possibly a slight rise for the week accounting for the general rise in output throughout the United States. It will again be necessary to omit individual performances by geographic regions for the week in view of the absence of individual figures. It is still believed, however, that the high point reached during the week ended December 18, 1943, will remain the high point for the year just passed.

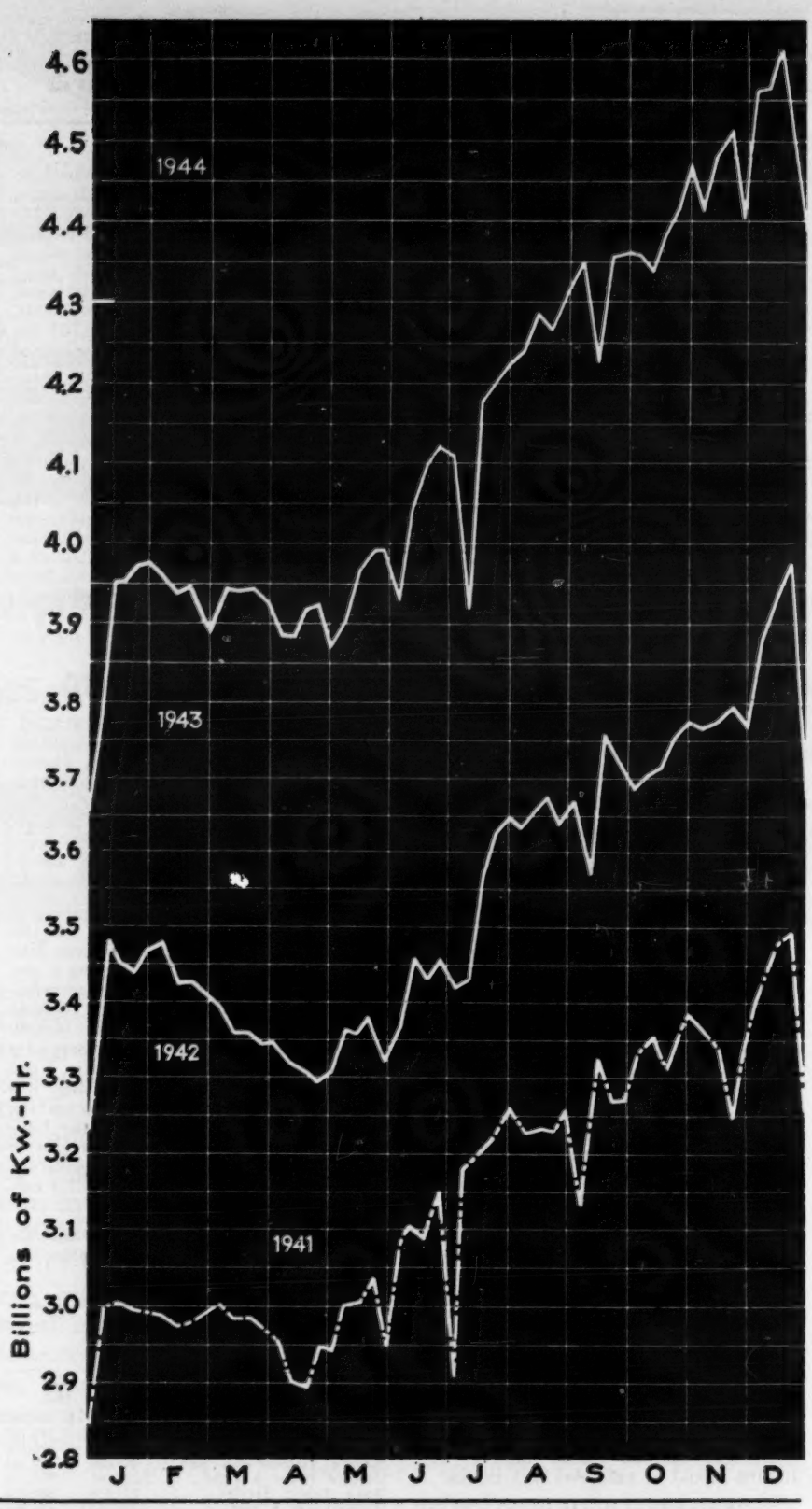
Weekly Output, Millions Kw.-Hr.

1944		1943		1942	
Jan. 1	4,300*	Jan. 2	3,780	Jan. 3	3,287
1943		1942		1941	
Dec. 25	4,295	Dec. 26	3,656	Dec. 27	3,234
Dec. 18	4,612	Dec. 19	3,975	Dec. 20	3,495
Dec. 11	4,566	Dec. 12	3,937	Dec. 13	3,475
Dec. 4	4,560	Dec. 5	3,883	Dec. 6	3,414
Nov. 27	4,403	Nov. 28	3,766	Nov. 29	3,339
Nov. 20	4,513	Nov. 21	3,795	Nov. 22	3,247
Nov. 13	4,482	Nov. 14	3,776	Nov. 15	3,348
Nov. 6	4,414	Nov. 7	3,762	Nov. 8	3,368
Oct. 30	4,452	Oct. 31	3,775	Nov. 1	3,380
Oct. 23	4,415	Oct. 24	3,752	Oct. 25	3,341

Percent Change from Previous Year

	Week Ending		
	Jan. 1	Dec. 25	Dec. 18
New England		+10.2	+ 7.0
Mid-Atlantic		+18.5	+16.3
Central Industrial		+10.1	+10.7
West Central		+ 9.4	+ 6.0
Southern States		+20.7	+19.4
Rocky Mountain		+15.6	+15.0
Pacific Coast		+34.5	+31.0
Total United States	+13.8*	+17.5	+16.0

*Subject to revision.



Energy Production Rises 18.5% in November

Electric energy produced for public use in November totaled 19,223,109,000 kw.-hr., an increase of 18.5 percent over production in November, 1942, the Federal Power Commission reports.

Average daily production of electric energy for public use in November was 684,096,000 kw.-hr., a new high level and an increase of 1.3 percent over average daily production during the previous month.

Production by water power in November amounted to 6,023,392,000 kw.-hr., or 31.3 percent of the total output for public use.

Utility Coal Consumption

Electric utility power plants consumed 7,128,361 tons of coal in November, the Federal Power Commission reports. The report indicates coal stocks of electric utility power plants as of December 1, 1943, were 9.8 percent less than stocks of the same date last year.

SEC DECISIONS-HEARINGS

The Securities and Exchange Commission, in a series of orders issued last week affecting electric utility companies:

APPROVED THE PROPOSED SALE by Middle West Corp. to Ralph J. Green of 13,887½ shares of common stock of its subsidiary, Missouri Gas & Electric Service Co., for $352,400 in cash and the distribution of the proceeds among Middle West stockholders at any time within a period of two years. Divestment of its common stock interest in Missouri Gas by Middle West was ordered by the commission, at the request of the holding company.

APPROVED THE RECAPITALIZATION PLAN of the Florida Light & Power Co., involving sale at competitive bidding of $45,000,000 of first mortgage bonds and $10,000,000 of sinking fund debentures and sale to banks of $5,000,000 of special notes. The $60,000,000 deal, in which Florida Power has had the concurrence and collaboration of its parent, American Power & Light Co., and its grandparent, Electric Bond & Share Co., calls for contributions by both of the overlying companies.

APPROVED THE PROPOSAL of Walnut Electric & Gas Corp., a subsidiary of General Water, Gas & Electric Co., to sell all the outstanding securities of its subsidiary, Oklahoma Electric & Water Co., which it owns to Southwestern Public Service Co.; the payment of a liquidating dividend by Walnut to General, and the dissolution of Walnut. The securities consist of a $500,000 6 percent demand note and 17,500 shares of $10-par value common stock. The proceeds would be devoted to payment of a $37,984 promissory note held by the International Utilities Corp., Walnut Electric's indirect parent, plus $8,024 accrued interest.

APPROVED A PLAN for the distribution of 1,120,600 common stock shares of the Delaware Power & Light Co. among holders of the 23,252,005 outstanding capital shares of United Gas Improvement Co., Philadelphia. Among the 65,000 stockholders who will receive one Delaware share for each twenty U.G.I. shares presently held in U.G.I.'s parent, United Corp., which will receive 303,311 shares, or 26.09 percent of Delaware's stock.

GRANTED TO THE General Gas & Electric Co. a reargument in the case of the Virginia Public Service Co., whose plan of recapitalization has been approved. General Gas & Electric had asked a rehearing and leave to adduce additional evidence on the SEC's determination that Virginia was not indebted to it for $1,200,000 of Virginia bonds and that an escrow fund of $1,165,166 should be paid over to Virginia.

ANNOUNCED THAT IT HAD FOUND "not unreasonable" the $67,000 fees to be paid the First Boston Corporation of New York and the New York law firm of Beekman, Bogue, Stephens & Black, in connection with the issuance and sale of $42,000,000 aggregate principal amount of first mortgage bonds by Utah Power & Light Company.

APPROVED, WITH RESERVATIONS, a Commonwealth & Southern Corp. and Ohio Edison Co. plan for the proposed retirement of all outstanding preferred stock of the Ohio utility. The 95,598 shares to be retired include all of the $6.60, $7 and $7.20 series, of which 84,464 are publicly held and 12,134 are held by Commonwealth. The publicly held shares would be redeemed at $115 plus accrued dividends and those owned by the parent company at about $95 plus dividends, aggregating $9,713,360 for the publicly held and $1,142,707 for the Commonwealth shares, exclusive of dividends.

APPROVED, SUBJECT TO CERTAIN CONDITIONS, an amendment to an agreement entered into between Consolidated Electric & Gas Co. and certain of its subsidiaries which join with it in filing federal income and excess-profits tax returns. In effect, the amendment provides that if any subsidiary company which is a party to the agreement shall sell or exchange all or a substantial part of its assets, any resulting loss shall be excluded in computing the amount to be paid by each subsidiary to the parent company as its share of the consolidated tax liability.

Applications Filed

A PROPOSAL TO ISSUE AND SELL $16,500,000 of first mortgage bonds and $4,000,000 of 3¼ percent series debentures by Florida Power Corp. The debentures will be sold to John Hancock Life Insurance Co. The financing is part of a refunding program which will be put into effect upon consummation of the merger of Florida Public Service Co., Sanford Gas Co. and Santa Fe Land Co. into Florida Power.

A JOINT DECLARATION of the Electric Power & Light Co. and its subsidiary, Mississippi Power & Light Co., covering a proposal by Electric to make a capital contribution to Mississippi of a share of common stock, $6 preferred stock, $6 second-preferred stock and debt in the form of a demand loan, now owned by Electric. Upon receipt of the contribution, Missisippi will reduce its capital stock liability in the amount of $6,149,941 by retiring the 1,493 shares of $6 preferred, 35,000 shares of $6 second-preferred and 500,000 shares of common stock surrendered by Electric for cancellation.

REQUEST OF THE Bangor (Me.) Gas Co. and its parent, American Gas & Power Co., to reduce its outstanding capital stock from $600,000 to $480,000 by decreasing the par value of the 6,000 shares (all owned by American) from $100 to $80.

REQUESTED THE COMMISSION to act as expeditiously as possible on the request of Illinois Power Co. for an exemption from the competitive bidding requirement of Rule U-50 for the proposed private sale of $65,000,000 of the company's first mortgage and collateral trust bonds. Proceeds from the sale of the bonds, and the sale of between $4,000,000 and $5,000,000 of serial notes, together with other funds of the company's treasury, will be applied to the redemption of its presently outstanding first and refunding bonds, series A and series C, aggregating approximately $69,900,000, at their redemption price, plus accrued interest.

PETITION OF THE Central Ohio Light & Power Co. for approval of the proposed issue and sale of $4,300,000 face amount of first mortgage bonds, series A, 3½ percent, to be dated February 1, 1944, and matured February 1, 1974. The bonds are to be offered for public sale by competitive bidding. Proceeds from the sale, together with treasury cash, will be used to redeem and retire all the company's first mortgage bonds presently outstanding, totaling $4,375,000, and including the callable premium total funds required will be $4,656,522.

Hearings Scheduled

JANUARY 10: The matter of Associated Electric Co.'s proposal to sell to William E. Vogelback, a non-affiliate, for the base price of $750,000, all of Associated Electric Co.'s interest in its wholly-owned subsidiary, Union Gas & Electric Co.

JANUARY 13: The matter of Associated Electric Co.'s proposal to sell to Malvern Hill, a non-affiliate, for the base price of $720,000 all of Associated Electric's interest in its subsidiary, Lake Shore Gas Co. Associated Electric also proposes to acquire from Lake Shore Gas Co. all of the latter's holdings of 550 shares of common stock of Atlantic Utility Service Corp., for a total cash consideration of one dollar.

JANUARY 26: The matter of Associated Electric Co.'s proposal to sell to Joseph E. Wilson, a non-affiliate, for the base price of $1,285,000, in cash, subject to adjustment, all of Associated Electric's interest in its subsidiary, Ohio-Midland Light & Power Co. Associated Electric Co. also proposes to acquire from Ohio-Midland Light & Power Co. all of the latter's holdings of 55 shares of common stock of Atlantic Utility Service Corp., for a total cash consideration of one dollar.

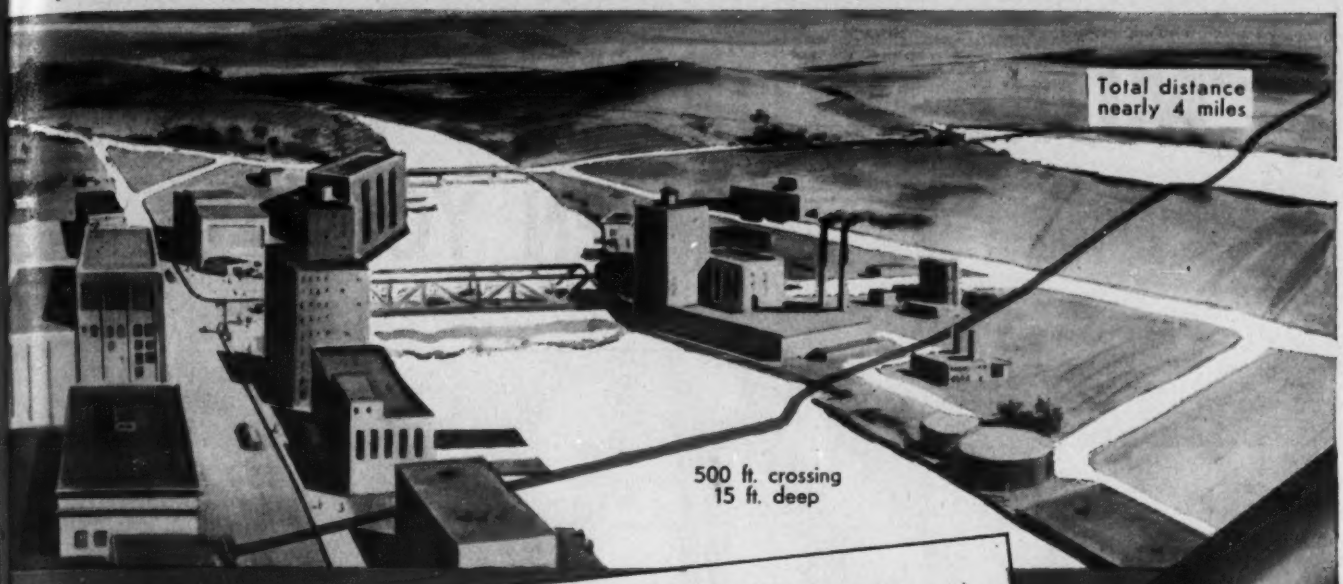
Utility Reports

	Net Income 1943	1942
*Birmingham Electric	$1,375,726	$1,174,287
*Carolina Power & Light	2,534,910	2,375,159
*Central Arizona Lt. & Pwr.	904,458	820,475
*Central Vermont Pub. Serv.	400,084	290,984
*Florida Power & Light	2,287,041	1,971,113
*Iowa Public Service	631,538	806,762
*Kansas Gas & Electric	1,346,066	1,494,842
*Louisiana Power & Light	1,122,744	1,289,954
*Mississippi Power & Light	709,411	607,102
*Montana Power and subs.	4,054,190	3,343,859
*Nebraska Power	1,712,781	1,444,854
*New Orleans Pub. Service	1,872,860	2,419,513
*Pacific Power & Light	1,215,646	773,610
*Pennsylvania Power & Light	5,881,351	5,242,410
*Sioux City Gas & Electric	640,888	571,182
*Texas Power & Light	2,744,922	1,787,875
*Twin State Gas & Electric	238,139	213,578
*Washington Water Power and sub	3,286,664	2,373,333

*Twelve months ended November 30.

To Redeem Utility Bonds

The New York Trust Company, as trustee for Safe Harbor Water Power Corp.'s first mortgage sinking fund bonds, 4½ percent series, due 1975, has called for redemption on February 3, 1944, $112,000 principal amount of the bonds through operation of the sinking fund. Payment will be made at 103 and interest on and after February 3 at the principal New York office of the trustee.



The First SUBMARINE INSTALLATION

Low-pressure Gas-filled Cable Goes on 34.5-kv Duty

ONE Midwest utility, already serving a capacity load on its 34.5-kv network, had to increase that capacity in order to supply a new war plant. The best method was to put in a two-circuit, direct tie between two points in the system nearly four miles apart.

The only route available for this tie lay through a congested duct system in a downtown area, and included two 500-foot river crossings, with a water depth of 15 feet.

Various types of cable were considered. Some were unsuited because of small manholes, congested conditions in the downtown area, or the possibility of electrolysis. The requirements indicated a need for the simplest type of cable affording the utmost reliability at low cost.

Therefore, gas-filled cable, with its favorable thermal and dielectric characteristics, was selected. Also, sheath damage to this type of cable can be detected without circuit failure. The installation is now in successful operation.

For information about G-E gas-filled cable, ask the nearest G-E office for Bulletin GEA-3652, or write *General Electric Company, Schenectady, New York.*

GAS-FILLED CABLE *Offers*

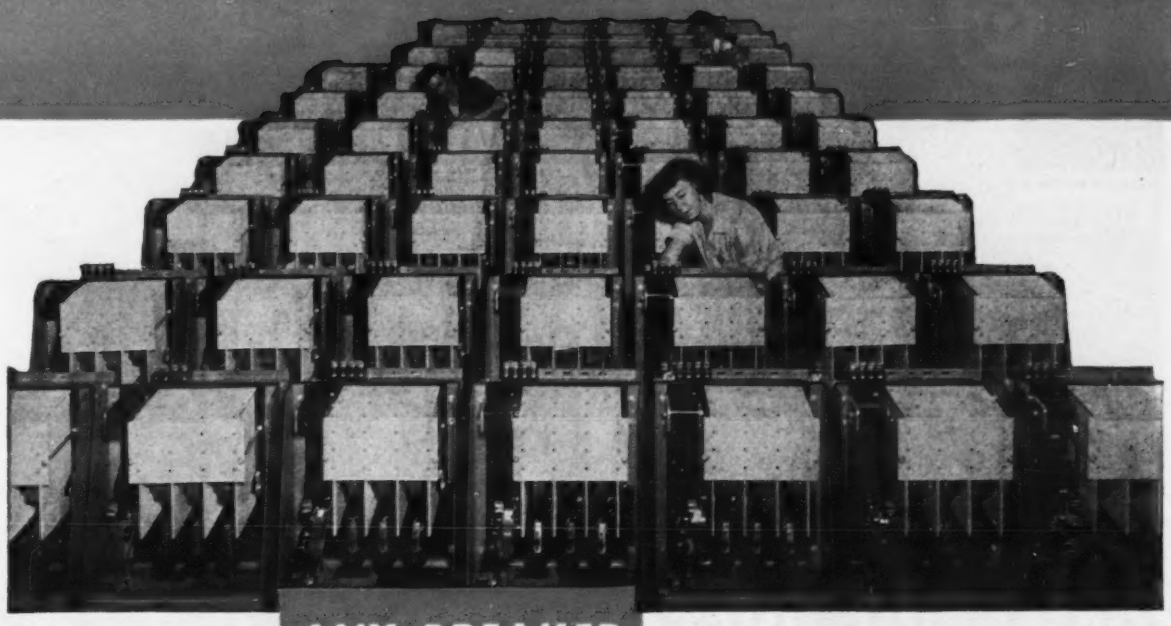
1. SELF SUPERVISION—prompt automatic warning if a leak occurs
2. ECONOMY—easy to install, no auxiliary manhole equipment
3. SMALL SPACE REQUIREMENTS—more power for a given duct size
4. UNIFORMITY OF INSULATION—no need to worry about compound migration

Invest in your future. BUY WAR BONDS

GENERAL ELECTRIC

501-19-1200

MORE WORKING MINUTES
WHEN YOU USE G-E



ANY BREAKER FITS IN ANY HOUSING

The ideal condition

Your maintenance investment is lower when all your drawout breakers are alike, as they are in these outdoor unit substations. Then you need very few spare breakers to serve many equipments.

Interchangeable, drawout air circuit breakers afford a high degree of power-service continuity. Every breaker is electrically, mechanically, and thermally co-ordinated for proper operation.

Drawout air circuit breakers help boost your production because they are conservatively rated and easy to operate. You should have fewer and shorter power interruptions after you install drawout-breaker equipments.

PACKAGED SWITCHGEAR

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

EVERY WORKING DAY
DRAWOUT-BREAKER EQUIPMENTS
to protect power circuits of 600 volts and below

How you add working minutes

By reducing time lost after power interruptions. To restore service, you simply turn the breaker handle. Or—if breakers are *electrically operated*—push a button.

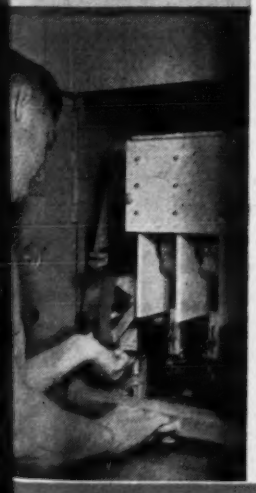
By reducing inspection time. You can inspect a drawout air circuit breaker in less than two minutes. In the inspection position, the breaker is easily accessible, disconnected from live parts. One man often can inspect all the breakers in a medium-size equipment during a lunch period.

By reducing maintenance time. Long shutdowns for maintenance are unnecessary, because drawout breakers are interchangeable. Any breaker can be replaced by any spare of the same type and rating. This permits immediate restoration of service, and maintenance of breakers at your convenience.

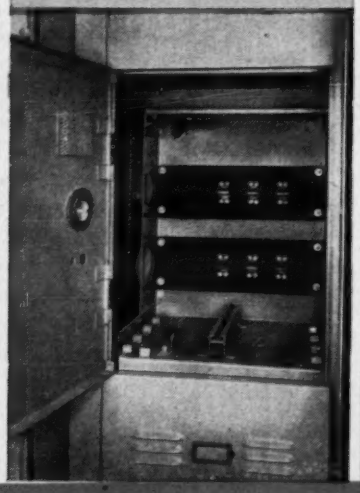
Drawout breaker equipments have proved so popular that we build them on a mass-production line. You get, with a saving in cost, the best breakers we know how to build. For more information, write for Bulletin GEA-2596. *General Electric Company, Schenectady, N. Y.*

Your workers quickly become familiar with both indoor equipment (shown here) and outdoor equipment, because the breakers are the same in both. This makes training of maintenance men easier.

g routine maintenance, save many hours of time.



Inspect as usual. Then, if necessary, lift breaker out, put



in a spare, and restore power. The breaker that you removed

goes first to the maintenance shop, and then joins the spares.

GENERAL ELECTRIC

HOW DESIGN... CONSTRUCT OPERATE MAINTAIN

Vibration Dampers Stop Tube Failures

By E. J. DREWELOW

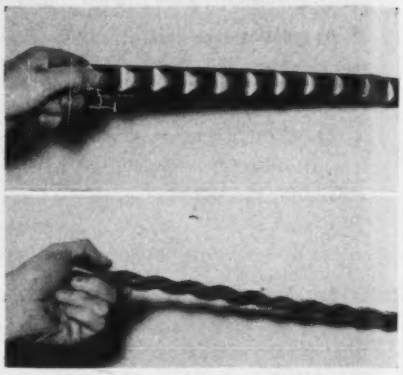
Chief Engineer Riverton Station, Empire District Electric Company, Riverton, Kan.

Short lengths of 1-in. O.D. condenser tube "corrugated" as shown in the accompanying illustrations when wedged between rows of condenser tubes have proved to be a convenient and effective means of stopping destructive vibration of tubes in a condenser handling more than its rated steam flow.

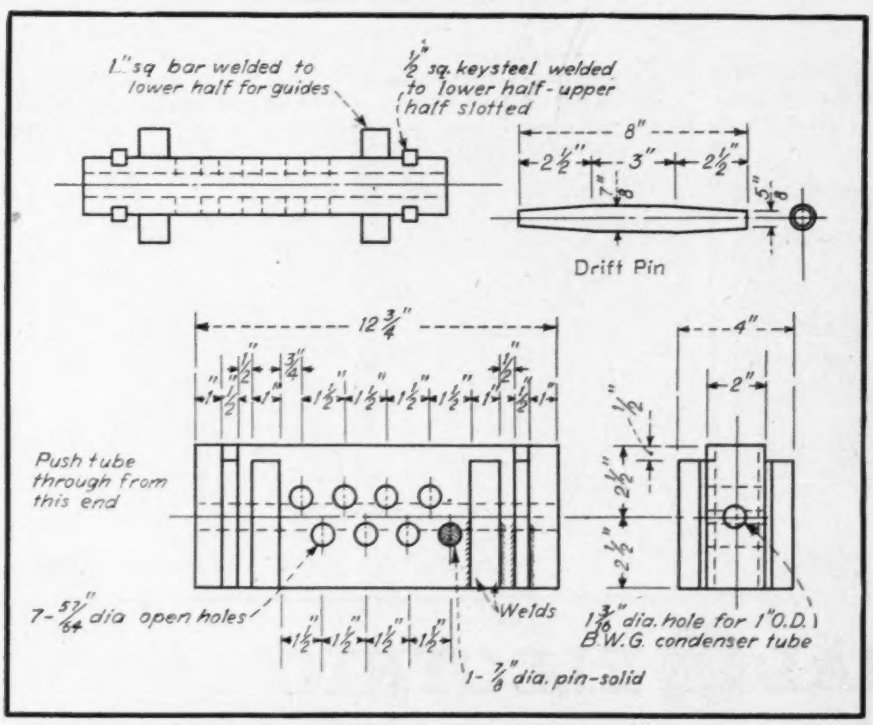
Tube vibration trouble arose at Riverton station following the rebuilding of a turbo-generator to increase its capacity from 20,000 to 25,000 kw. Redesign increased the steam flow from the turbine to its associated 27,000-sq.ft. condenser from 240,000 to 375,000 lb. per hour. This increased flow set up tube vibration between support sheets in the condenser that resulted in the failure increase in the rate of condenser tube failures from a negligible number up of one or two tubes per week. Failures occurred in the top several rows of tubes ranging anywhere from the first row to 18 in. down in the tube nest.

Appearance of the straight circumferential fracture left little doubt that vibration was the cause.

The tubes used to lace the condenser were corrugated by pressing 1-in. diameter arbors into both sides of 30-in. scrap lengths of condenser tube. Corrugations on the two sides of the tube are staggered to correspond to the tube spacing and are 1½ in. apart. A jig (shown) was made up in the shop for crimping the damper tubes.



CORRUGATED "lacing tubes" wedged between rows of condenser tubes stop destructive vibration



DRIFTPIN driven into holes in jig is used to crimp damper tubes

Tubes crimped in this manner were inserted between rows of tubes by the simple expedient of inserting a "broomstick" between the condenser tubes and wedging them apart far enough to allow the corrugated tubes to be inserted. These "lacing tubes" or "vibration dampers" were placed between tube rows about midway between condenser tube support sheets. When first inserted the lacing tubes were staggered; then when all dampers were in place those between adjacent rows of tubes were wedged up as nearly in line as possible in order to hold the condenser tubes firm.

In the period of several years since these dampers were installed condenser tube failure has been reduced to practically zero; a total of eight tubes having failed in the ensuing period.

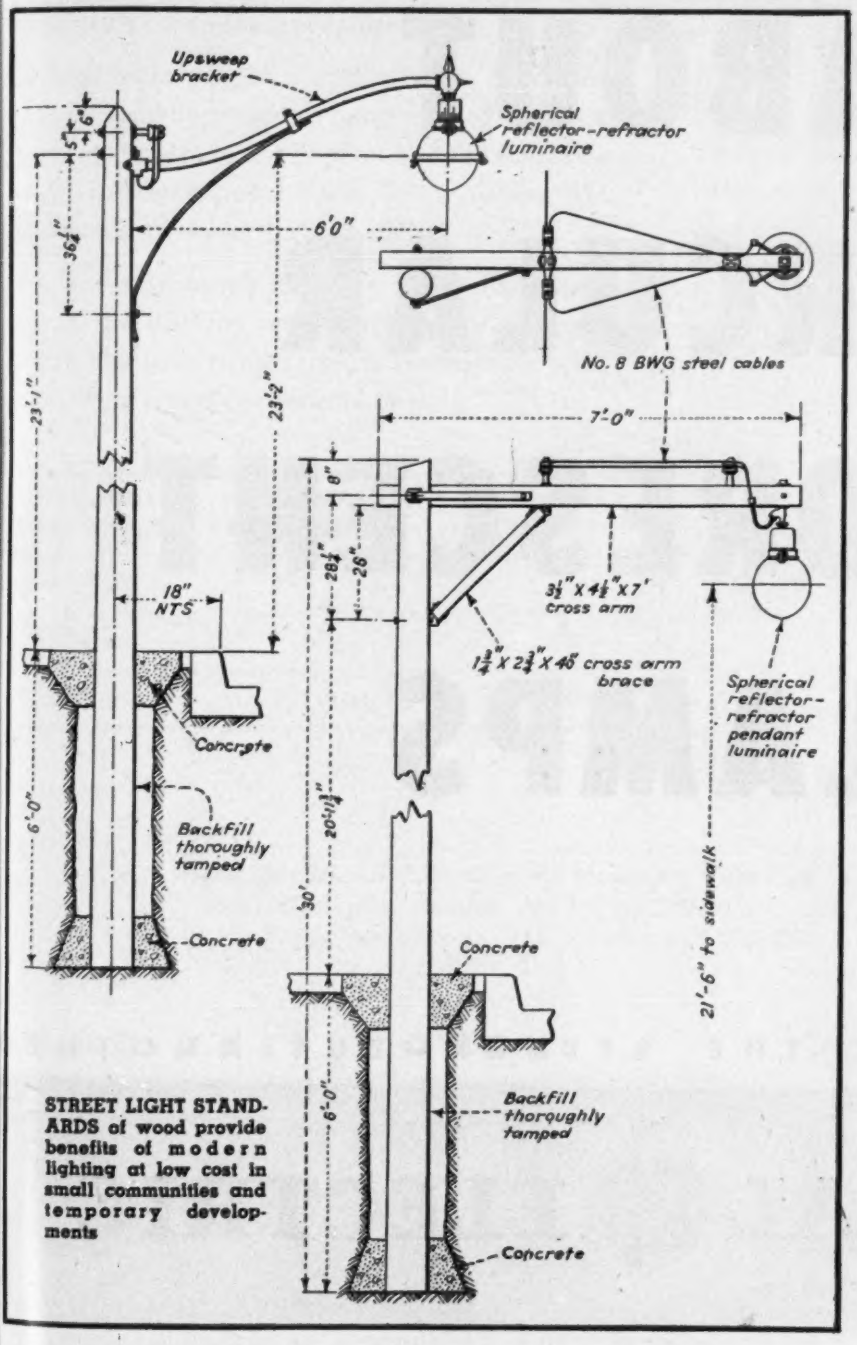
Modern Lighting With Low-Cost Standards

Two low-cost designs of semi-ornamental street lighting standards have been developed by the Oklahoma Gas & Electric Company to provide the benefits of modern street and highway lighting in municipalities that cannot justify more expensive installations. Both designs shown are for systems with overhead street lighting circuits; however, they are easily converted to underground circuit arrangement if desired.

In both designs 30-ft., class 6, shaved, creosoted, Southern yellow pine poles are specified for the standards. One design, developed before Pearl Harbor, specifies a metal upsweep bracket. The second, a wartime design, makes use of a 7-ft. wood crossarm and crossarm brace to support the spherical reflector-refractor type pendant luminaire. In this latter standard a minimum amount of metal has been used. About the only metal parts required are the pole line hardware, the housing for luminaire and the incidental steel conductors required for its connection to the lighting circuit.

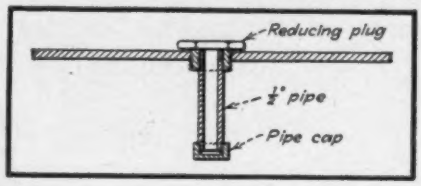
Use of the metal upsweet bracket in the pre-war design gives a somewhat higher mounting height for the luminaire (23 ft., 2 in.) than does the crossarm bracket (21 ft., 6 in.). However, the difference is small enough to be negligible.

These standards have been used in several communities on the Oklahoma Gas & Electric Company system. The wartime design is also applicable in temporary housing and industrial developments.



STREET LIGHT STANDARDS of wood provide benefits of modern lighting at low cost in small communities and temporary developments

Wartime Thermometer Wells



When they couldn't obtain delivery on the usual type of brass thermometer wells for a cooling water line, because of material shortages, operating engineers at the Ohio River station of Southern Indiana Gas & Electric Company, Evansville, improvised several "wartime" wells like the above, using a reducing plug, short piece of ½-in. pipe and a pipe cap. They will "do" for the duration.

Stop Pole Fires by Killing Grass

Constant source of annoyance to operating departments during dry fall seasons is the loss of poles due to grass fires. In the present war period these losses are more than essentially serious because manpower is not always available for immediate pole replacements.

A program for killing grass in the spring around important poles may prevent fires in the fall. The work may be done by unskilled help and will conserve the time of the linemen and other skilled help required for pole replacement.

Iowa State College extension service suggests three methods of killing grass. The first is to apply coarse salt, about 3 lb. per pole, in a ring about 1 ft. from the pole. The second suggestion is to use powdered crude borax and use about 3 to 4 lb. around each pole the same way as above. The third method is to use the regular

A STATEMENT ABOUT CIRCULAR FLUORESCENT LAMPS

LET'S ALL BACK THE ATTACK—BUY ANOTHER

GENERAL ELECTRIC

A CONSTANT aim of General Electric Lamp Research has always been to supply the best lamp for every lighting need. There is such a need, we feel, for certain sizes of circular fluorescent lamps for decorative types of fixtures and portables, often for use in various combinations with incandescent lamps.

Considerable research had already been done on circular fluorescent lamps prior to Pearl Harbor. However, the project had to be set aside when the facilities of our laboratories were directed entirely to the war effort.

G-E Lamp Research has been . . . and still is . . . at war, but looking toward the future we expect to add the following circular fluorescent lamps to our line when conditions permit:

APPROXIMATE OUTSIDE DIAMETER	MAXIMUM BULB DIAMETER	APPROXIMATE WATTS
8½ in.	T-10	20
12¼ in.	T-10	30
16 in.	T-10 or T-12	40

No production facilities for these lamps are now available and therefore no samples can be furnished. We will make a further announcement to the trade as to the availability of the lamps and details of ballasts, sockets, etc. in advance of the time they go into production.

• • •

Starting with Edison's first successful lamp, General Electric scientists and engineers have been working to make lamps that give more and more light for less and less money. The G-E mark on a lamp is your assurance of the latest developments from G-E Lamp Research.

"TO MAKE LAMPS STAY BRIGHTER LONGER"
The Creed of G-E RESEARCH

Hear the General Electric radio programs: "The G-E All-Girl Orchestra," Sunday, 10 p. m. EWT, NBC; "The World Today," news every weekday, 6:45 p. m. EWT, CBS

BOND THIS MONTH!

G-E MAZDA LAMPS

weed-killing chemicals, either sodium chlorate or atlicide, the same way at the rate of 1 to 2 lb. per pole.

Either borax or salt is usually preferable to the weed-killing chemical. Borax and salt will leave residual effects in the soil longer than either chlorate or atlicide. In other words, one treatment of salt should be effective for two or three years, and in the case of borax, perhaps somewhat longer. The chemicals should be put on in the spring before vegetation makes the job more difficult.

These methods of destroying grass around poles were reported in a paper by C. N. Marple, Iowa Public Service Company, presented at the Engineering Conference of the Missouri Valley Electric Association.

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Insulation Tester Has Safety Circuit

By L. H. NEWELL
Transformer Application Engineer, Westinghouse Electric & Manufacturing Company, Sharon, Pa.

A 2-kva., 6,000/3,000-volt portable insulation test set has been developed wherein all live parts, except test prods, are fully inclosed. Ground shields protect the operator should test leads become damaged. The case and transformer core are grounded through a third conductor of the supply cable.

Capacity of the set is such that all electrical apparatus having less than 0.15 mfd. capacity to ground can be tested at 6,000 volts or less and apparatus having less than 0.6 mfd. capacity to ground can be tested at 3,000 volts or less.

The portable set combines in a single unit:

1. A 2-kva., 6,000/3,000/120-volt, single-phase, 50/60-cycle, dry-type, air-cooled transformer with a voltmeter coil which is so located with respect to the high-voltage winding that its ratio is practically constant at all voltages. Series or parallel connection is made by removing the plug-in, high-voltage test leads and changing links on the terminal board underneath the plug.

2. A variable auto-transformer connected in the low-voltage circuit and operated by a hand wheel on the top of the set varies the testing voltage from zero to maximum (determined by the series or parallel connection

VOLTAGE having been adjusted on insulation tester, operator makes test while his thumb of right hand depresses control button on test prod; unit has 15-ft. test leads and 20-ft. supply cable

of the high-voltage winding). Close approximation of the test voltage is afforded by a calibrated dial (in kilovolts) and pointer on the hand wheel. The complete voltage range is covered by a 320-deg. turn of the handwheel.

3. A flush-mounted, double-scale voltmeter accurately indicates the voltage at the test terminals at all times.

4. A manually operated type AB 250-volt, 50-amp., two-pole breaker equipped with a 20-amp. thermal trip element serves as a line switch and also protects the set from excessive overload.

5. Green and red indicating lights, contactors and push buttons. The push button in the test handle or on the set must be depressed during test to maintain voltage on the test terminals.

To operate the set, the supply cable is plugged into a three-wire polarized receptacle with one ground terminal. When the line breaker is closed the set is energized, with the exception of the testing transformer, which is separated from the rest of the circuit by contactors.

A green light, which is connected in the circuit through a "break" interlock on a relay, indicates that the set is energized and ready for operation. When either control button is pressed, and held down, the contactors close, applying voltage to the testing transformer. A "make" interlock on one of the contactors closes the red light circuit, indicating voltage on the testing terminals. The test voltage may be raised gradually from zero to the maximum value without opening the circuit by turning the voltage control handwheel. If the push buttons are released the two contactors open in sequence, with surge-preventive resistance in the last step.

When a failure or flashover of the test piece occurs, so as to raise the test current in excess of full load current, the overcurrent relay trips, opening the contactors. In order to close the contactors again the push button must be released to allow the relay to reset. This prevents "pumping" of overcurrent relay and contactors.

When the push button is again depressed the contactors close and voltage is again applied to the testing terminals.

Double control by the push buttons provides for flexibility—test voltage may be applied gradually by the operator stationed at the set or for rapid routine testing the voltage may be set at the desired value and applied to the test piece by the operator using the control in the test handle.

•

Solving Side-Hill Foundation Problem

Loose overburden, subject to movement, made it undesirable to use anything that would function as a retaining wall in mounting six heavy oil circuit breakers on a side hill at Pit No. 5 power house of Pacific Gas & Electric Company. A concrete pier, or column, was placed under each concentrated load and a deck was supported on brackets extending out from the column heads on all four

CONCRETE PIERS and platform provide side-hill oil switch mounting

sides. This provided the necessary support and at the same time offers little resistance to downhill movement of surface material.

ROCKBESTOS A.V.C. Wires and Cables

Provide the most direct approach to eliminating wire failures in lighting, control and power circuits

Rockbestos A.V.C. Power Cable above and similarly insulated Motor Lead Cable (Underwriters' and Nat. Elec. Code, Type AVA) has a maximum operating temperature rating of 110° C. (230° F.) and this permanently insulated construction. See detail, upper left.

THE ROCKBESTOS CONSTRUCTION THAT PROVIDES LONG WIRE LIFE*

1. The conductor is perfectly and permanently centered in helically applied insulation.
2. Impregnated felted asbestos insulation withstands conductor-heating currents and won't burn, even under overloads up to the melting point of copper.
3. Lubricated varnished cambric for high dielectric strength and added moisture resistance, protected from heat, flame and oxidation between two felted asbestos walls.
4. Outer felted asbestos wall impregnated with heat, flame and moisture resistant compounds serves as a heat-barrier against high ambient temperatures.
5. A tough, rugged asbestos braid, resistant to heat, flame, moisture, oil, grease and corrosive fumes.

**One of 122 different wires and cables developed for severe operating conditions by Rockbestos.*

WON'T bake brittle, bloom, burn or rot.
RESISTS moisture, oil, grease and fumes.

600 VOLT A.V.C. BOILER ROOM WIRE—TABLE C
(Underwriters' Type AVA)

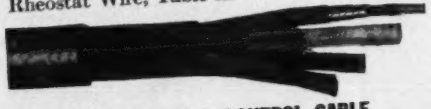
Sizes No. 18 to 4/0 AWG. This construction for sizes 18 to 8, sizes 6 to 4/0 have another wall of impregnated asbestos next to the conductor.

For lighting and control circuits exposed to heat and moisture, oil, grease, corrosive fumes or fire hazard, such as exist around furnaces, ovens, lehrs, soaking pits, boilers, etc., this widely used A.V.C. construction is ideal.

600 VOLT ALL-ASBESTOS RHEOSTAT CABLE—TABLE R
(Underwriters' Type AI)

Sizes No. 18 AWG to 1,000,000 CM insulated with a heavy wall of impregnated asbestos, covered with a rugged asbestos braid in black, white or colors.

Use this power and rheostat cable for wiring rheostats, elevator and locomotive control panels, and electrical equipment exposed to heat, fumes and fire hazard. Also for general open wiring in dry, high temperature locations. For solid conductor specify Rockbestos Rheostat Wire, Table A.



600 VOLT A.V.C. CONTROL CABLE

In one to 19 conductors. Standard stranding AWG No. 12—19/-25 and No. 9—19/-22. Other strandings furnished on order.

Designed for use under conditions too severe for control cables with other insulations which deteriorate rapidly when exposed to high temperatures. Operates without failure under attack of heat, oil, grease or corrosive fumes and may be installed in conduit as it has ample moisture resistance.

FOR VICTORY BUY WAR BONDS

There are two ways to practically eliminate wire-failures in electrical circuits around furnaces, soaking pits, steam tunnels, lehrs, kilns and other high temperature locations. One is to move the circuits away from the "hot-spot" area, but that might be impossible or too costly. Another, is to install wire with an insulation that is unaffected by heat and built to stand up under severe operating conditions.

Rockbestos A.V.C. wires, cables and cords are designed and constructed to provide lasting trouble-free performance. They stand up where other wires fail because the *permanent* impregnated asbestos insulation resists heat and moisture, oil, grease, alkalies and corrosive fumes, and won't bake brittle, crack, flow, rot or swell.

Get the facts on Rockbestos A.V.C. See for yourself how these *permanently insulated* wires and cables keep wire-failure down to the minimum in lighting, power and control circuits. When inquiring or ordering, please furnish CMP allotment number and certification. For complete information and samples, write nearest branch office or:

Rockbestos Products Corporation, 926 Nicoll Street
New Haven 4, Conn.

ROCKBESTOS A.V.C.

The Wire with Permanent Insulation

NEW YORK, BUFFALO, CLEVELAND, CHICAGO, PITTSBURGH, ST. LOUIS, LOS ANGELES, SAN FRANCISCO, SEATTLE, PORTLAND, ORE.

HOW TO DETERMINE SIZE OF GUY WIRE*

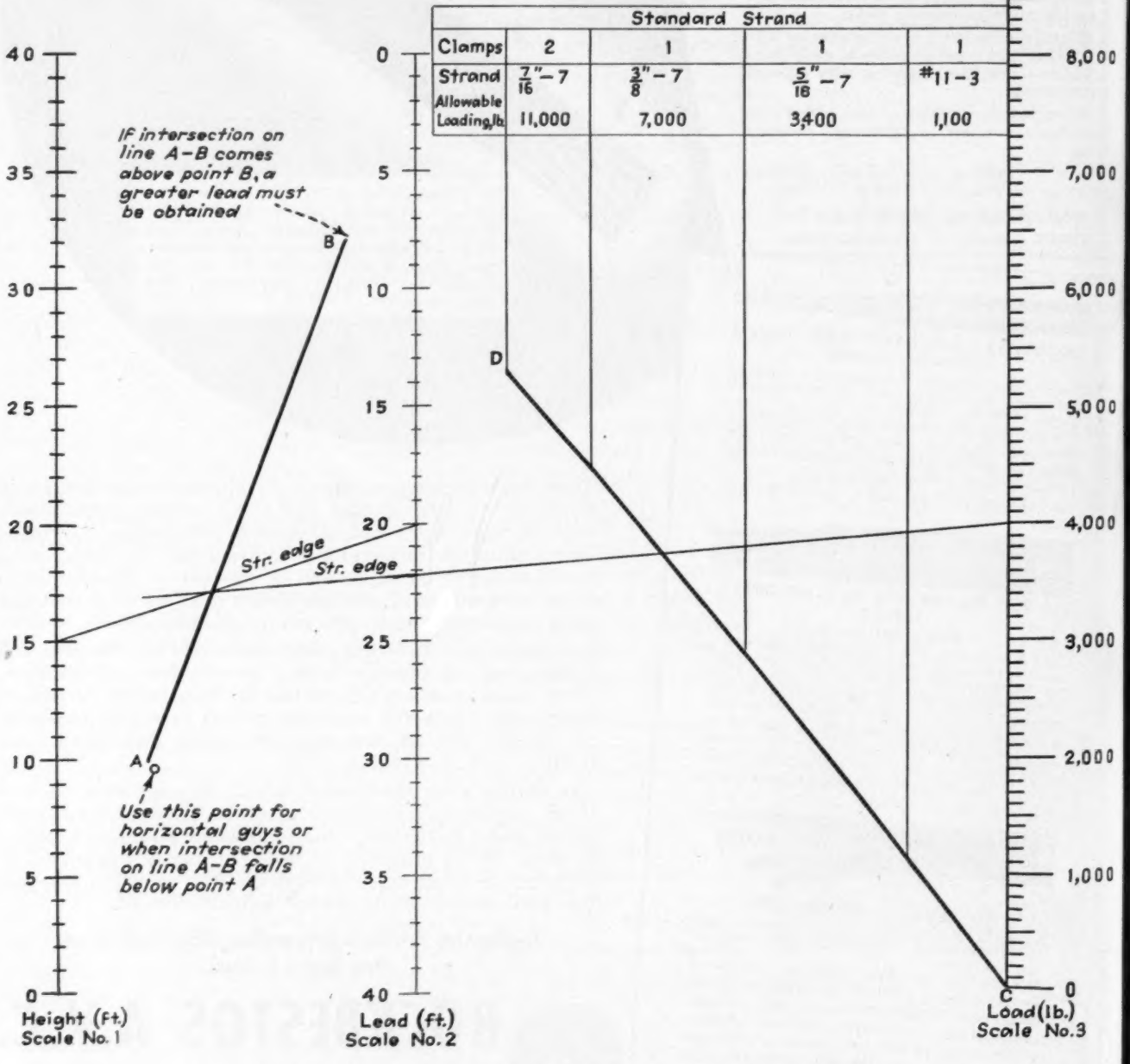
By use of the accompanying chart the size of guy strand can be found when the lead (L), height (H) and load (lb.) are known.

Instruction for Use of Chart—Lay a straight edge on the chart passing through the height (H) on scale 1 and the lead (L) on scale 2, marking its intersection with line AB. Then lay the straight edge on the chart passing through this intersection and the known load on scale 3. Read the size of guy strand from the line CD.

NOTES—1. If either height or lead exceeds 40 ft., divide both height and lead by 2 or 3, whichever makes the quotients fall within the ranges of scales 1 and 2.

2. When two guys are required, find size needed to support one-half horizontal load.

Example—For a 20-ft. lead attached 15 ft. above ground a 4,000-lb. load requires use of a seven-strand, ⅜-in. guy wire.


Standard Strand
Clamps 2 1 1 1
Strand 7/16"–7 3/8"–7 5/16"–7 #11–3
Allowable Loading, lb. 11,000 7,000 3,400 1,100
If intersection on line A–B comes above point B, a greater lead must be obtained
B
A
D
C
Str. edge
Str. edge
Use this point for horizontal guys or when intersection on line A–B falls below point A
Height (Ft.) Scale No. 1
Lead (ft.) Scale No. 2
Load (lb.) Scale No. 3
40 35 30 25 20 15 10 5 0
0 5 10 15 20 25 30 35 40
11,000 10,000 9,000 8,000 7,000 6,000 5,000 4,000 3,000 2,000 1,000 0

* Adapted from a book of standards of the New England Power System.

You can rely on Pole line Hardware that bears the L-M trademark

LM

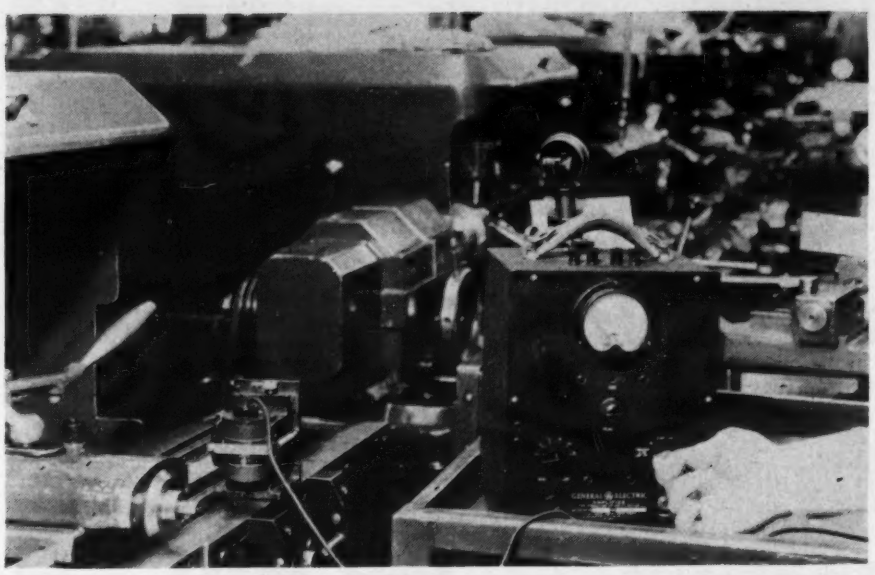
✓ designed the way you want it

✓ built to last

✓ packed for convenience

✓ RIGHT in ALL WAYS

LINE MATERIAL COMPANY



VIBRATION on grinding machine is measured by vibration-velocity meter

Meter Aids Detection of Vibration

An electronic vibration-velocity meter was used recently to detect the cause of vibration in grinding machines at the plant of John Bath & Company, Worcester, Mass., manufacturer of high-precision taps. The vibration in one machine in particular was causing a large number of rejects. An investigation made with the aid of the instrument revealed that a set of gears in this machine, apparently in good condition, caused the vibration. Replacing the gears eliminated the difficulty.

The Bath concern also found the meter valuable for detecting low-vibration areas in its plant, thus facilitating the placing of new equipment in areas where maximum operating efficiency was assured.

Consisting of a vibration pick-up unit and electronic amplifier unit, the meter, manufactured by General Electric Company, measures vibration velocity and, together with an integrating unit, vibration displacement. The amount of vibration can be analyzed graphically by the use of an oscilloscope fed by the amplifier.

•

Use Old Insulators on Rural Lines

Having on hand a large number of old side-groove porcelain insulators displaced from distribution construction by the increasing employment of brackets, the Virginia Electric & Power Company found a use for them in the building of rural lines. Pins were made of $\frac{3}{8}$-in. soft-bar stock. On one end of the pin a groove thread was cut and on the other a fetter thread with its sharp ridges sloping away from the end.

A $\frac{3}{4}$-in. hole is bored in the side of the pole at an angle of 45 deg. and the fetter thread end of the pin driven in. Tape is then wrapped around the groove thread and the insulator screwed on, making a solid support for rural primary and secondary conductors.

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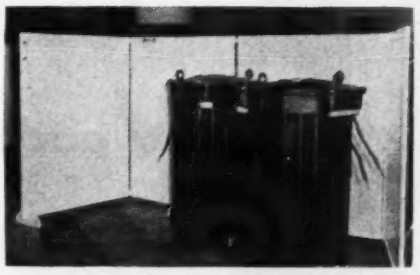
Safety Barrier



Four-section safety barriers, made of 48x36 in. panels of wall board in 1x2-in. frames joined by strap hinges, are used at the transformer test and repair shop of Kansas Gas & Electric Company, Wichita, to close off areas where high-voltage tests are in progress on distribution transformers. Although only one barrier is shown in the illustration, two are normally used completely to inclose the test area. When not in use the barriers fold compactly, leaving the floor area free for traffic.

•

Capacitors Improve Welder Performance

By B. L. McARDLE
Electrical Engineer United Steel & Wire Company, Battle Creek, Mich.*

When the United Steel & Wire Company turned to war production—landing mats for airplane fields—its requirement of electricity for resistance welding was greatly increased. It was calculated that hourly demand of the plant would be 505 kva., but that instantaneous demand might be much more, resulting from coincidences of welding operations. Tests of the welding machines provided for mat production showed values of the order of 460 kva. and 47 percent power factor for the average 10-cycle welding operation.

Under these conditions the voltage drop from the point of regulation at the bus in the utility substation amounted to 25.8 percent. The breakdown of drop showed 11.3 percent in the 7,200 ft. of No. 6, 5-kv. feeder and the 600-kva. transformer bank. The remaining drop of 14.5 percent was in 125 ft. of 500,000-cir.mil, 500-volt welder feeder. It was obvious that the supply line must be improved. This was done by changing the 5-kv. feeder to No. 0 conductors, replacing the transformer bank with a three-phase, 1,000-kva. low-reactance unit and installing "Buss-Wa" for local distribution. It was figured that these charges would reduce the drop to 10 percent; 11 percent was shown by test later.

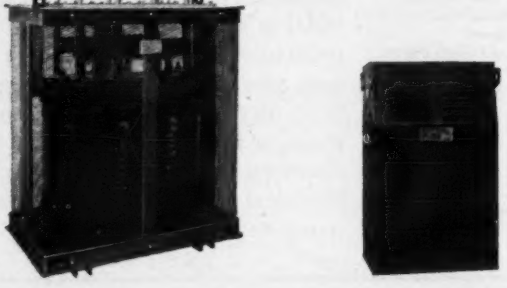
Further improvement in voltage regulation was accomplished by installation of series capacitors on the welding machines. The capacitors raised the welder voltage, thus permitting a faster input of energy to the weld, reducing its time and speeding up production. They also improved the power factor and cut down the ampere demand. At the low power factor condition of operation without capacitors the instantaneous demand could not exceed 1,750 kva. without causing objectionable lighting flicker on the utility system. Raising the power factor to unity, accom-

*Now in U. S. Army.

MOLONEY AIR-COOLED TRANSFORMERS

For Indoor Installation *Without* Fireproof Vaults

600 Kva, 3-Phase Type BDL Air-Cooled transformer with Class B insulation. Rated 13800 volts delta primary to 460Y/266 volts secondary with 6-2½% taps available on terminal board located on side of transformer.



Left: 150 Kva Type BDL transformer. Type BDL is supplied in sizes from 150 to 1500 Kva in primary voltages from 480 to 13800 volts. *Right:* Type BDC. This type is supplied in sizes 15 to 100 Kva in primary voltages from 480 to 4800 volts.

It's Safe and Economical to Install Type BDL and BDC Transformers Indoors

THESE Air-Cooled transformers are insulated with approved Class B materials including glass, asbestos and porcelain. Since no cooling liquid is used, fire and explosion hazards are eliminated and Type BDL and BDC transformers may be safely installed at load centers without the expense of vault construction.

Because of the absence of a cooling liquid, there is practically no maintenance cost when using either Type BDL or Type BDC Air-Cooled transformers. There is no liquid to require periodic testing and conditioning. There are no valves, no gasketed surfaces, no cooling tubes or radiators to maintain.

Type BDL transformers are contained in expanded metal cases and Type BDC in louvered sheet-metal cases. Both types of cases are attractive in appearance and make the most effective use of cooling air for the particular design of the windings involved. Large cooling ducts are provided in the windings to permit rapid movement of a large volume of cooling air. The windings are designed to provide a maximum amount of coil surface for efficient cooling.

Moloney Air-Cooled transformers with Class B insulation may be used safely and economically in all industrial applications.

MOLONEY ELECTRIC COMPANY • ST. LOUIS, U.S.A.

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plished by the capacitors, lifted the allowable instantaneous demand to 3,600 kva. and permitted more freedom in welder operation. Further, the improved voltage at the welder did much to avoid erratic operation of the phase-shift electronic control of welder timing.

If series capacitors had not been used tolerable voltage drop could have been obtained only by the use of a much larger quantity of scarce materials in strengthening the energy supply system and welding would have been slower and less well controlled.

•

How to Test Insulating Material*

3. Dielectric Strength Tests

By F. W. JAHNS, JR.
Continental-Diamond Fibre Co., Newark, Del.

A protective electrical insulation will be punctured when a measured voltage gradient, known as the dielectric strength, is exceeded. For this specific electrical property the numerical value is the ratio of the breakdown voltage to the thickness of the dielectric between electrodes.

Here the primary consideration will be given to a discussion of the dielectric strength of flat sheets. Due principally to differences in construction and methods of manufacture, the dielectric strengths of rods, tubes and molded shapes are not the same as sheets whose thicknesses are equivalent to the wall thicknesses of these other forms.

Dielectric strength for thin solid materials should be measured either perpendicular or parallel to the laminations of the sheet, depending upon the direction in which the electrical stress is to be applied. In some instances it is important to have the dielectric strength in both directions; that is, measured perpendicular and parallel to the laminations of the sheet.

In the perpendicular or transverse direction the test is made between standard 2-in. diameter by 1-in.-long disk electrodes. In the parallel method of test the sheet is cut into sections 2 in. square and holes are drilled in opposite ends so that they will be in the same plane and the inner ends will be ½ in. apart. Tight-fitting metal electrodes are inserted in the drilled holes, whose diameters are about 25 percent of the sheet thickness. The dielectric strength parallel to laminations is expressed in total kilovolts required for breakdown.

In the commonly used test methods (ASTM D-229 and D-149) for solid materials, determinations for dielectric strength are made in oil kept at the same temperature as the test specimen. The electrical stress can be applied either by the "Short-Time" or by the "Step-by-Step" method. In the Short-Time procedure, the voltage is continuously increased at the rate of 0.5 kv. per second. In the Step-by-Step method the initial voltage is adjusted to 50 percent of the short-time breakdown value and then increased as shown in Table I, the voltage being held at each step for one minute. Factors which have an effect on dielectric strength are listed in Table II.

Although dielectric strength is important, it is not a satisfactory basis for sole judgment in the appropriate use of an electrical insulator. As an example, in the case of a switchboard handle it is possible to have a satisfactory initial dielectric strength that is satisfactory, but then find that the material is of no use because of lack of resistance to humid conditions which may prevail in the proposed application. Also, due consideration must be given to such attributes as machining characteristics and physical and other electrical properties of the insulator being used.

*This series began in "Electrical World," December 11, 1943, issue.

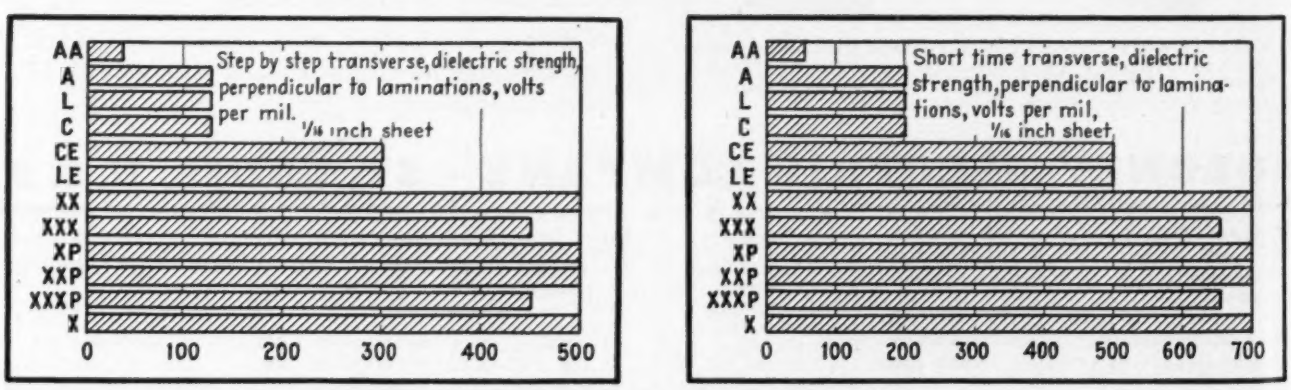
Table I—Test Voltage for Step-by-Step Method

Breakdown Voltage, Kv., by Short-Time Method	Increment of Increase of Test Voltage, Kv.
25 or less	1.0
Over 25 to 50 incl.	2.0
Over 50 to 100 incl.	5.0
Over 100	10.0

Table II—Factors Affecting Dielectric Strength

Factor	Effect on Dielectric Strength	Remarks
Thickness of material...	Increasing thickness decreases v.p.m	Decrease is approximately proportional to 2/3 to 3/4 power of the thickness
Size of electrode.....	Increasing diameter decreases v.p.m.	Most pronounced with thin sheets and is negligible with thick sheets
Frequency.....	Increasing frequency decreases v.p.m.	Effect is usually small up to 100 cycles. At radio frequencies, v.p.m. may be 10 to 20 percent of its value at 60 cycles
Rate of increase in voltage	More rapid increase elevates the v.p.m.	
Temperature*.....	Increasing temperature decreases v.p.m.	
Moisture*.....	Increase in moisture decreases v.p.m.	

* Effects of temperature and moisture will be further discussed in succeeding articles.



TYPICAL DIELECTRIC STRENGTH VALUES for various grades of laminated phenolic insulations

AN ANNOUNCEMENT OF GREAT IMPORTANCE TO THE BUILDING INDUSTRY

WHAT types of electrical equipment will be needed in the homes of tomorrow?

Where should fixed equipment be placed in kitchens and laundries? How about dimensions and clearances—access for servicing—lighting outlets and controls—utility connections?

Westinghouse has long recognized the need for accurate information on these subjects . . . and for this reason has created the

BETTER HOMES DEPARTMENT

The Westinghouse Better Homes Department was created to assist the building profession in the planning of postwar housing . . . and to give authoritative technical advice on the *proper applications of electricity* which will contribute so much to better living in 194X.

To achieve these ends, Westinghouse has organized the *Better Homes Advisory Staff*, consisting of men of recognized standing and wide experience in the housing field:

IRVING W. CLARK, MANAGER, who has been continuously engaged in housing activities for nearly 25 years . . . a nationally recognized authority on home planning and kitchen design . . . and a Director of Producers Council, Inc.

A. CARL BREDAHL, TECHNICAL DIRECTOR, formerly Chief of the Mechanic-Electrical-Utilities Division of the Federal Public Housing Authority from 1934 to 1943, where he was responsible for establishing design standards of mechanical and electrical installations for U. S. Government housing projects . . . and for 7 years electrical designer for Warren & Wetmore, New York.

JOHN S. VAN WART, REGISTERED ARCHITECT, formerly with Fred F. French Company, New York, who has designed many multiple dwellings, hotels, and institutions during the past 30 years . . . including Knickerbocker Village, 10 Gracie Square, and Blind Brook Lodge in the New York area.

SIX-POINT ADVISORY SERVICE

The Better Homes Department offers a *Six-Point Advisory Service* to the building profession, featuring advice on the following subjects:

1—Selection of correct types of electrical equipment for various classes of postwar homes.

2—Location and arrangement of fixed equipment, for conserving space and attaining maximum efficiency in arrangement of work cycles.

3—Accurate dimensions and clearances of equipment to insure proper installation and efficient operation.

4—Access for servicing of equipment—so necessary for periodic inspection and repair.

5—Location of lighting outlets and controls, for greater enjoyment, comfort, and safety in the home.

6—Utility service connections—including location and size of electric wiring, water supply, and drainage lines.

This Six-Point Advisory Service is available to public utilities, architects, engineers, contractors, builders, housing authorities, electrical inspectors, building management, and investment institutions.

Westinghouse Better Homes Department welcomes the opportunity of giving constructive assistance to those interested in postwar housing.

If you have any problems relating to the selection, installation, and use of home electrical equipment, write: Better Homes Department, Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.

A NEW APPROACH TO ELECTRICAL LIVING IN 194X

A carefully co-ordinated program . . . for assisting the building profession and homeowners in the attainment of *better wiring for better living* . . . will be announced soon.

Watch for it!

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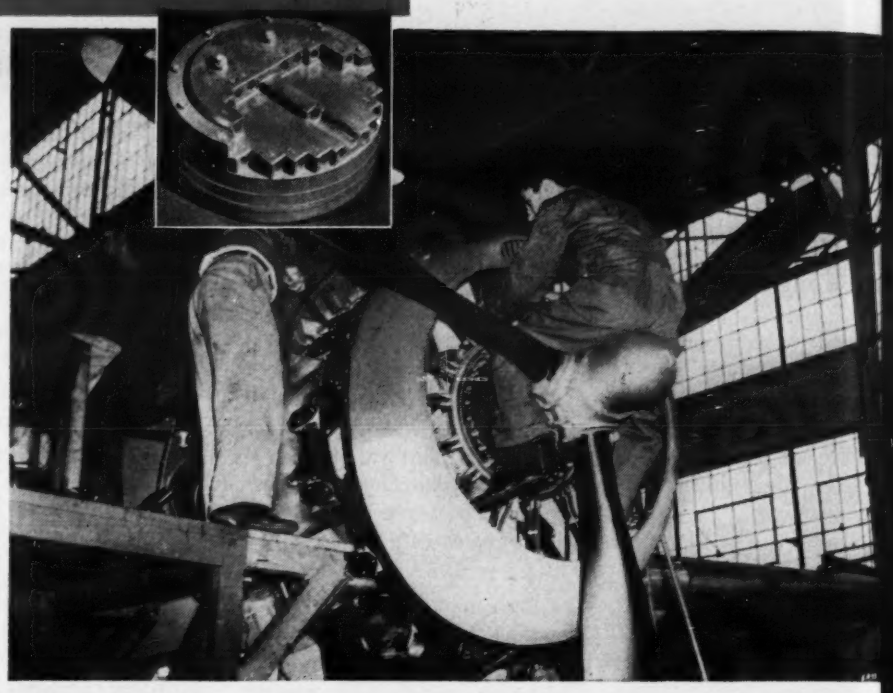
PLANTS IN 25 CITIES OFFICES EVERYWHERE

LIFE ON THE PLASTICS NEWSFRONT

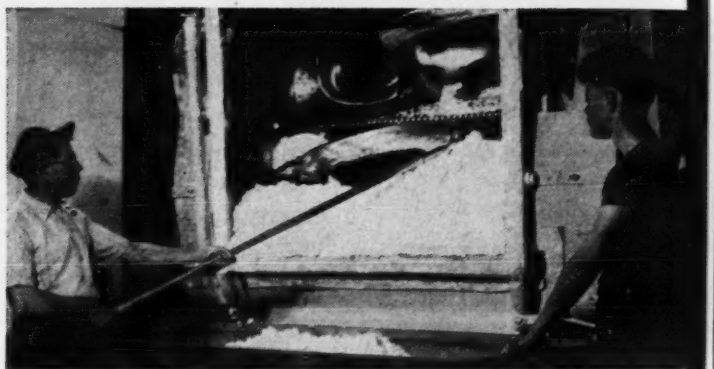
KEEP POSTED ON CHANGES IF YOUR PLANS INCLUDE PLASTICS

Keep in touch with your molder or raw material supplier concerning *availability* of various plastic materials. The situation is improving and more material may be made available shortly for production of civilian items such as radio cabinets, lighting reflectors, clock cases, etc.



(*Right*) **WATCHLIKE PRECISION** of tremendous radial aircraft engines in our modern planes such as this torpedo bomber is dependent on each part doing its job. Mineral-filled MELMAC*, high dielectric Cyanamid plastic, is used for parts like the distributor housing shown in inset because of its excellent electrical characteristics—high arc resistance, dielectric strength and heat resistance, as well as for its good physical properties. Other electrical applications for MELMAC include ignition assemblies, insulation parts, shields, switch plates, cable connector inserts and circuit breakers.

(*Below*) **CYANAMID CHEMISTS** are working with the most modern equipment to create new uses for plastics. Shown here is a photo taken at the Cyanamid Research Laboratories from the sound and color film, *This Plastic Age*, produced by Modern Plastics magazine. It covers the activities of the entire plastics field and is shown to manufacturers and molders, war plants, technical and educational groups, museums of art and science in the United States and Canada. A Spanish version was made and also a print for distribution in China.



(*Above*) **FROM THE MIXING MILL** comes BEETLE*—another Cyanamid plast of good dielectric properties and color stability. Further information c Cyanamid plastics and resins for electrical and industrial applicatio for immediate or postwar production is available on request.

*Reg. U. S. Pat. O

AMERICAN CYANAMID COMPANY · PLASTICS DIVISION · 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

CYANAMID PLASTICS

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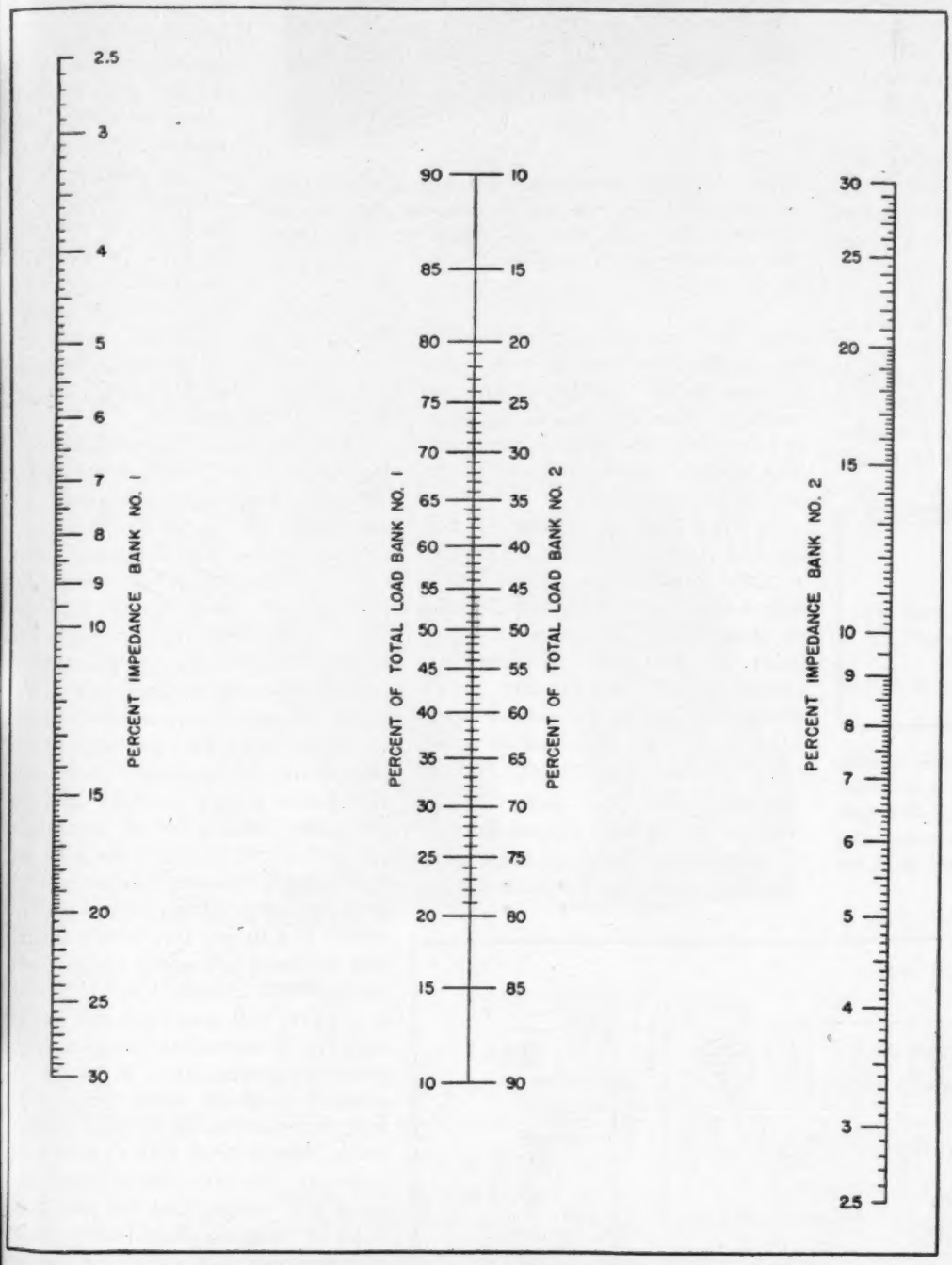
HOW TO DETERMINE DIVISION OF LOAD FOR TWO TRANSFORMER BANKS IN PARALLEL

By R. B. GEORGE, Electrical Engineer, Tennessee Valley Authority, Chattanooga, Tenn.

Chart is designed to estimate quickly the division of load between two transformers or two banks of transformers which are operated in parallel. It uses the principle of the division of load between two impedances connected in parallel.



INSTRUCTIONS FOR USE OF CHART

By a straight edge connect impedance values of the two banks on the respective outside scales. At intersection on center scale read percent of total load for each bank.

Assumptions made:

1. Transformers have equal voltage ratios.
2. Equal number of units in each bank.
3. Identical units in each individual bank.
4. No load on third winding if three-winding bank.
5. Equal ratios of X/R in order to use the percent impedance.
6. Two transformers, or two banks, which are operating in parallel are located adjacent to each other and are connected to the same buses by leads which have negligible impedance. If the transformers are not adjacent, or if their leads have impedances which are sufficient to affect the division of load, the percent impedance of the leads or lines from each transformer to the common junction point should be added to the impedance of the corresponding transformer.
7. If transformer banks have different kva. ratings impedances are converted to same kva. base.

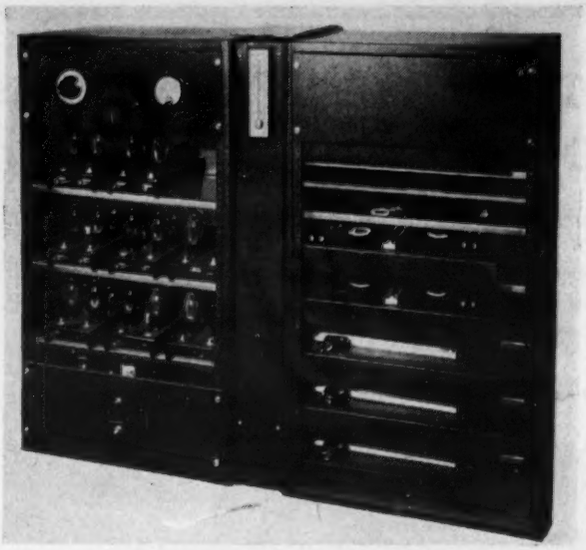
There are a few cases where the actual load division does not agree with the expected load division when it is calculated by any method. Such cases suggest the checking of the meter calibrations, the instrument transformer ratios or the impedances of the transformers involved.

Tuning Fork Standards for Meter Calibration

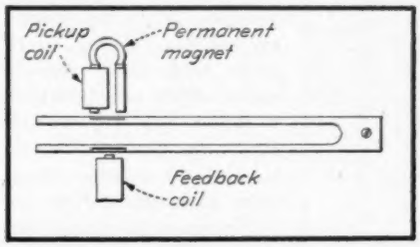
By DONALD E. ANDERSEN
Chief Engineer, J-B-T Instruments, Inc.
New Haven 8, Conn.

Checking frequency meter calibration against tuning fork standards which in turn can be checked against the Bureau of Standard's time signals provides an accurate system for manufacturing frequency meters. The standard frequencies are provided at convenient outlets throughout the plant. Average frequency deviations are not over 0.04 percent at ordinary room temperatures.

Frequency meters when being calibrated must be checked against some reliable standard. Each reed has a specified natural period of vibration and this must be within prescribed limits. Since the usual limit is about one-fourth of 1 percent, it is impossible to use the customary audio frequency oscillator due to inherent lack of stability within such limits. A rather simple method would involve the use of frequency meters for standards. However, this would necessitate the regular checking of each meter and one would be required for each operator. It would also be necessary to have many standards to accommodate various ranges between 20 and 500 cycles, and higher.



VIEW of complete installation. Three forks are mounted on one chassis; also two oscillators per chassis. Each unit removable for quick servicing, using extension cables, without interfering with remaining units.

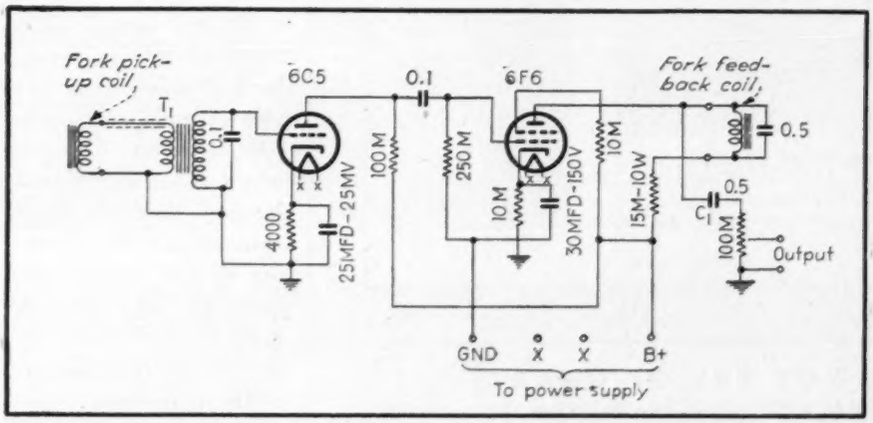


TUNING FORK showing position of oscillator coils. A soft iron insert is imbedded in the fork opposite each coil. The coils must be adjusted until fork is self-starting and does not overswing. Three forks are mounted on each chassis.

At J-B-T Instruments, Inc., 15 tuning fork electronic oscillators provide accurate standard frequencies which, with stroboscopic light, may be used to standardize oscillators at every point in the common frequency ranges and at most other points whether as low as 5 cycles or up to 1,000 cycles. As described in a previous article (ELECTRICAL WORLD, November 27, 1943, page 72) the standard frequencies are available to each operator, whether on the production line, inspection room, or for use by the research engineer making special tests. The output from each oscillator is carried by ordinary battery cable circuits to the various positions, where a small amplifier converts the voltage from a relatively high impedance circuit into sufficient power to operate a frequency meter. By selecting the frequency desired, a particular reed in that meter will then vibrate at the frequency of the tuning fork, and even though the reed is not perfectly in tune the operator is actually checking the oscillator against the tuning fork. This is accomplished by operating a stroboscopic light from the oscillator and "stopping" the vibration of the reed.

Each fork has its independent oscillator circuit and fifteen forks at the following frequencies are used: 48, 49, 50, 51, 52, 55, 57, 58, 59, 60, 61, 62, 63, 65, 68. The forks with their associated oscillators are located in two cabinets, each 36½ in. high by 21 in. wide and 14 in. deep. The forks are located in a separate cabinet to keep them at room temperature.

All components are mounted on removable chassis for ease in servicing and making preliminary adjustments. One power supply provides filament and plate voltages for all oscillators. A view of the two cabinets with the front panels removed is shown in an accompanying illustration, also a sketch of a tuning fork with a pickup and feedback coil which connect into the oscillator circuit. Each coil has a ¼ x 1½ in. soft iron core and wound with No. 42 enameled wire to a diameter of approximately ¾ in. Its d.c. resistance is about 5,000 ohms. The fork is mounted on a small rectangular bakelite block with a single bolt. Any one familiar with oscillator circuits will realize that the two coils must be properly phased in order to obtain proper fork control. Since the circuit has been simplified as much as possible, care must be taken in adjusting the distance between the coils and fork to permit proper starting and still prevent excessive amplitude.



OSCILLATOR CIRCUIT showing connections to fork coils. Plate current drain is approximately 13 m.a. All power, coil, and output connections made through octal plugs. There are two oscillators per chassis.

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says *Romey

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FROM BAR TO FINISHED WIRE

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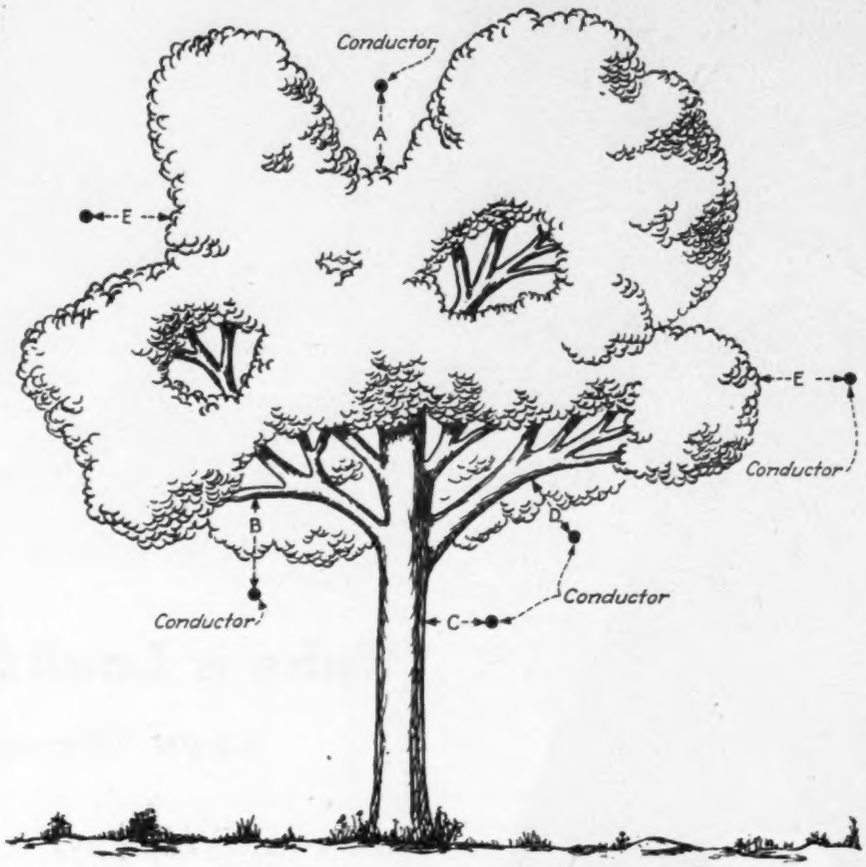
A GUIDE FOR TREE CLEARANCES



Recommendations for minimum clearance between conductors and trees of various rates of growth, also instructions for tree trimming, are adapted from a book of standardized practices for overhead line construction of the Detroit Edison Company.

Tree Classification for Rate of Growth

Fast Growing	Slow Growing
Ailanthus or Tree of Heaven	Ash
Basswood	Beech
Box elder or Ash Maple	Birch
Catalpa	Fruit trees
Cottonwood	Ironwood
Elm	Maple, hard
Maple, soft	Maple, Norway
Poplar	Nut trees
Willow	Oak
	Pine
	Sycamore

Recommended Minimum Clearance of Conductors (in Feet)

Distance from Conductor	Rate of Tree Growth	System Communication and Secondary	Primary	24/40 Kv.
A To top of tree	Slow	1	3	6
	Fast	2	5	8
B To overhanging limb	All — short limb	1	1	Avoid
	Slow — long limb	3	6	Avoid
	Fast — long limb	5	10	Avoid
		Sag of Line Plus		
C To main trunk	Slow	1	1	4
	Fast	2	2	6
D To main limb	Slow	2	2	5
	Fast	4	4	7
E To branches	Slow	3	3	6
	Fast	5	5	8

Note — Twigs or leaves shall not be allowed to touch system communication bare wires.

Trees shall be trimmed in conformity with the regulations of the governmental authorities having jurisdiction over the trees. In the absence of these regulations, trees should preferably be trimmed so that the trees will be left with a natural, untrimmed appearance and with a minimum of damage to the trees; however, this must be modified when the owner of a tree specifies other methods.

"There's Tested Strength in Every Length"

SPANG-CHALFANT

Division of The National Supply Company

Executive Offices: Grant Building, Pittsburgh, Pa.

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HOW "Automatic" FIRE-FOG WORKS

The way "Automatic" FIRE-FOG goes into action, when oil or other flammable liquid ignites, amazes—and re-assures—those who have seen it perform. In a matter of seconds this is what FIRE-FOG does:

A mist-fine water spray automatically blankets and chokes the fire. FIRE-FOG Nozzles, properly placed and directed at time of installation, assure the complete spraying of the fire area.

The cooling spray that so thoroughly encircles the fire, produces a "ring of isolation." Thus, the fire is confined and the danger of spreading is reduced to a minimum.

With FIRE-FOG actively and relentlessly spraying every square inch of burning surface, the flames are brought under control almost immediately and the fire is quickly quenched.

This, briefly, is the story of "Automatic" FIRE-FOG in action. The details of this outstanding system of fire protection should be *must* information for every executive concerned with fire protective measures. An "Automatic" engineer will be glad to call—no obligation, of course.

TEST IT—PROVE IT! At "Automatic's" Proving Ground in Youngstown, Ohio, full scale fires, using a quantity of your own flammable liquid, will determine the kind of fire quenching system you need. Your fire hazard conditions are reproduced, fires are started, experiments are made. *Guess-work is eliminated.*

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA ★ YOUNGSTOWN, OHIO

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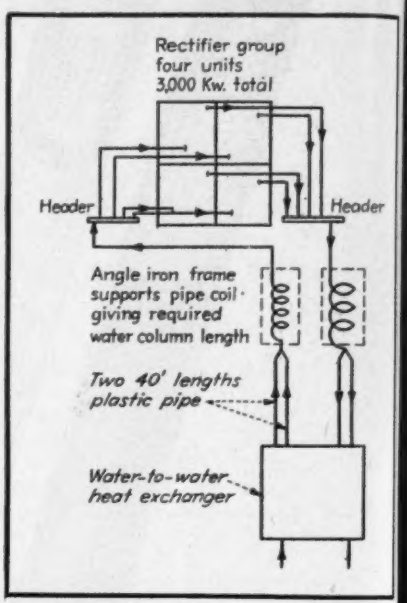
AUTOMATIC SPRINKLER CORPORATION OF AMERICA — RATE OF RISE — TRADE MARK REG. U.S. PAT. OFF.

Plastic Pipe Solves Electrolysis Problem

By J. J. SAMSON
Supervising Engineer, Equipment Section, Commonwealth Edison Company, Chicago

Plastic pipe made from a synthetic resin with a vinylidene chloride base co-polymerized with vinyl chloride is being successfully used in Chicago by the Commonwealth Edison Company as a substitute for rubber hose in the cooling water circuit between mercury-arc rectifiers and their associated heat exchangers.

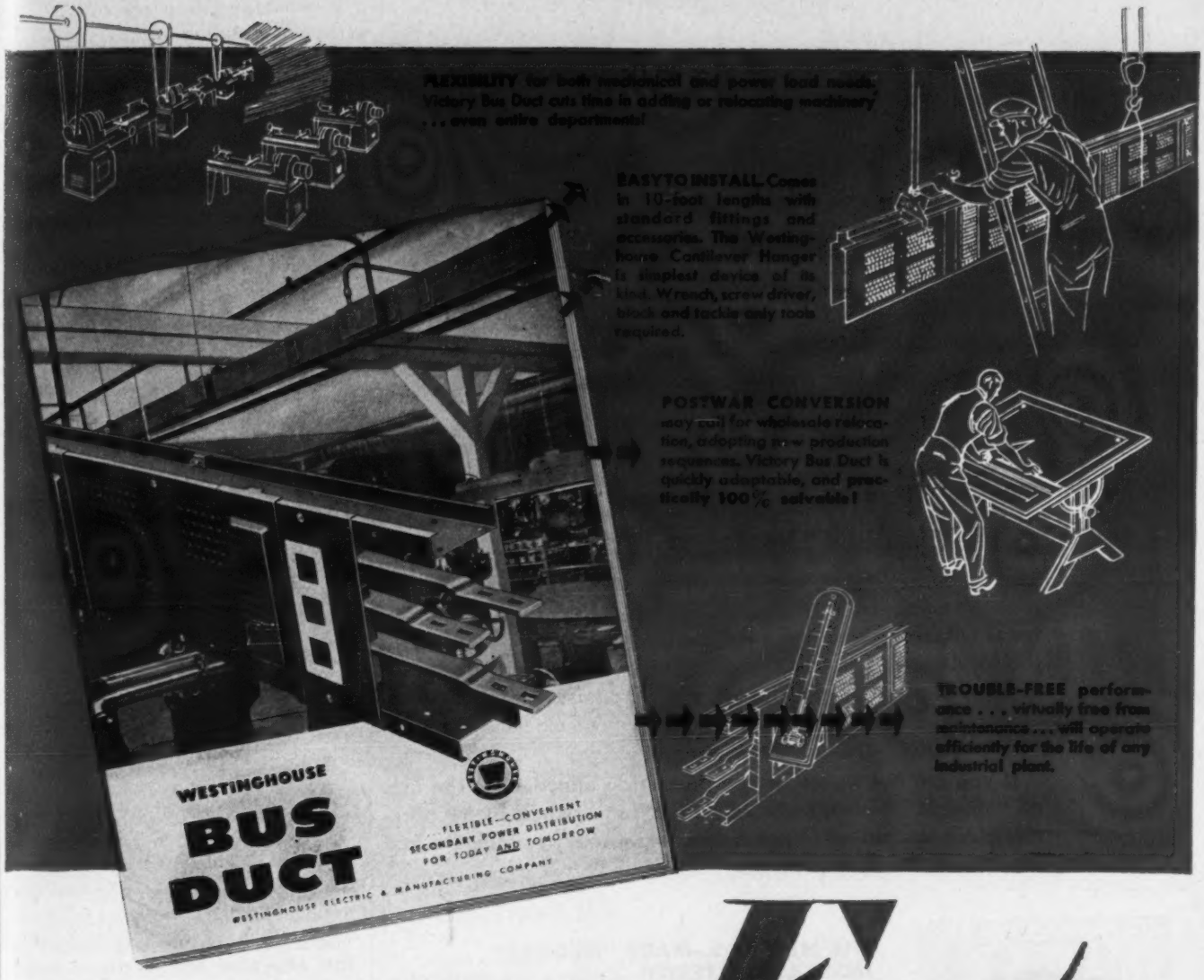
Because of the difference in potential (600 volts to ground) between the rectifier and its associated heat



PLASTIC PIPE replaces rubber hose as insulating link between mercury rectifier and heat exchanger

exchanger, the water column between the two must have a high resistance. An inhibitor (sodium dichromate) is added to this water to prevent scale formation and corrosion. The inhibitor greatly decreases the natural water resistance and it is therefore necessary to use approximately 100 ft. of 2 in. hose per rectifier installation. When natural rubber is used to carry an ionized liquid, it ages rapidly, particularly at the part where the ion concentration is great. Although only the best steam hose is used, its life is approximately four years. The hose procurable under war restrictions would have had a much shorter life.

In search for a substitute for hose for this use the vinylidene chloride plastic pipe was tested and installed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EASY TO INSTALL. Comes in 10-foot lengths with standard fittings and accessories. The Westinghouse Cantilever Hanger is simplest device of its kind. Wrench, screw driver, block and tackle only tools required.
POSTWAR CONVERSION may call for wholesale relocation, adopting new production sequences. Victory Bus Duct is quickly adaptable, and practically 100% salvable!
TROUBLE-FREE performance ... virtually free from maintenance ... will operate efficiently for the life of any industrial plant.
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Industrial distribution systems must be flexible to meet war's constantly changing demands ::: and must fit readily into post-war conversion plans.

Westinghouse Victory Bus Duct meets both today's and tomorrow's requirements. It has many exclusive features contained in no other type of duct. A few of its outstanding advantages are listed above.

Bus Duct FACTS are contained in Bulletin 3286. This bulletin is a concise ::: complete ::: usable handbook on Bus Duct. It tells why Victory Bus Duct should be used ::: why it meets Limitation Order L-273 ::: why every rating carries complete Underwriters' approval. In addition, it gives data on plug-ins and fittings; dimension data; and specifications.

Ask your Westinghouse representative for a copy or write Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.

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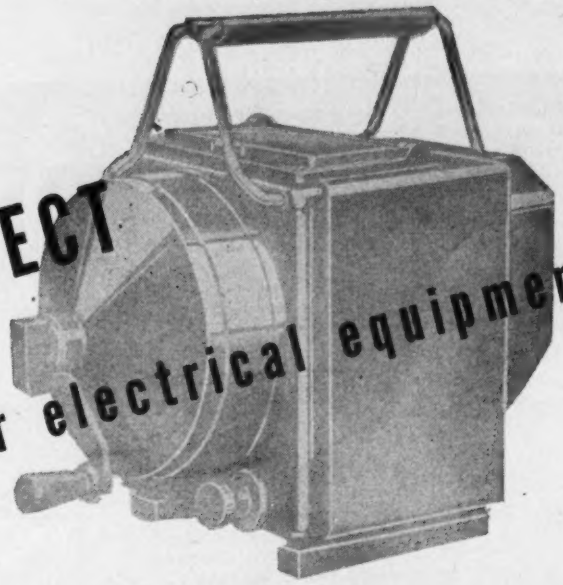

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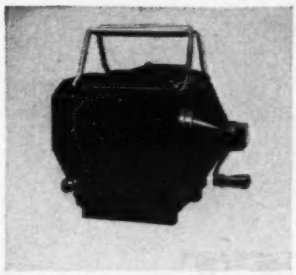
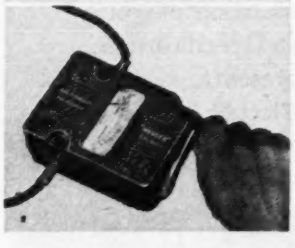
These remarkable instruments should be used by every maintenance man who is seriously interested in forestalling electrical failures. They detect moisture, dirt and deterioration in the insulation of practically all types of electrical equipment. Having hand-cranked generators they require no batteries or adjustments and are wholly independent of external circuits. Ready for use anytime—anywhere.

If you are not aware of the protection afforded by the use of "Megger" instruments and their importance in keeping electrical equipment in operation, write today for the Pocket Manual of "Megger" Practice, No. 1420-W.



THE NEW U. S.-MADE "MEGGER" INSULATION TESTER—Consists essentially of a direct-reading true ohmmeter of the permanent magnet moving coil type mounted with a d-c hand generator in a plastic molded case. Ranges up to 1000 megohms, with hand generators up to 500 volts. Widely used in hard service. Variable-pressure ("Meg") and constant-pressure ("Super-Meg") types. Bulletin 1735-W.

THE "BRIDGE-MEG" RESISTANCE TESTER—This instrument is a combined "Megger" Insulation Tester and a four-dial, multi-ratio Wheatstone Bridge. Will measure any ohmic resistance from .01 ohm up to 100 or 200 megohms; hand generators rated up to 1000 volts. A complete and compact resistance measuring unit that is ideal for power companies and industrial plants. Catalog 1685-W.



THE MIDGET "MEGGER" TESTER—In many ways the most remarkable "Megger" instrument ever built. Weighs only 3 lbs.—will fit an overcoat pocket or tool kit. Reads up to 50 megohms. Generates 500 volts and is always ready to use anywhere because of the hand crank. Send for Catalog 1685-W.

JAMES G. BIDDLE CO. • **1211-13 ARCH STREET PHILADELPHIA 7, PA.**

in what now appears to be a permanent installation.

This type of synthetic resin is thermoplastic. While it is rigid at normal temperatures, it softens on heating to temperatures in the range of 240 to 280 deg. F.

Thus the ends of two pieces of pipe can be satisfactorily "welded" together by placing them on a hot plate maintained at 400 to 500 deg. until a small quantity of molten material is formed and then pressing the ends together firmly while they cool. The pipe can also be threaded to take plastic pipe fittings. Allowable working pressures for the 2-in. size pipe used is 125 lb. psi., according to the manufacturers. In the present application, however, pressures do not exceed 20 lb. psi.

•

How to Close, Trip Circuit Breakers

12. Undervoltage Tripping*

By G. J. EASLEY
Switchgear Engineer, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

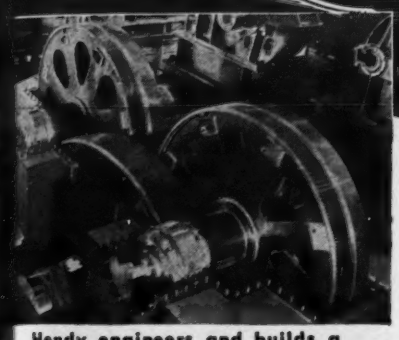
On industrial applications sometimes it is desirable to trip the breaker if the line voltage falls to an abnormally low value. This is particularly applicable to synchronous equipment, which will have difficulty pulling back into step after loss or dip in voltage. As in the previous methods, the undervoltage release attachment is also used with the light-trip attachment, with the exception of small breakers. It operates on the principle of a magnetic coil pulling against a spring or weight to prevent the trip plunger from tripping the breaker.

If the voltage on the coil falls to about 50 percent of normal, the spring or weight overcomes the coil and trips the breaker. Because the coil is not strong enough to reset the spring or weight, the latter must be manually reset or automatically reset by taking advantage of the breaker opening movement. The undervoltage coil is continuously energized when the breaker is closed—either directly from the main circuit (on low voltage breakers), or through a transformer connected to the main circuit.

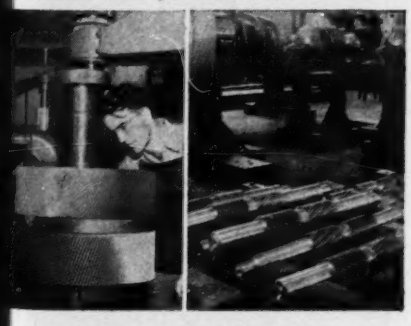
The undervoltage trip, as described, is instantaneous in its response to loss or dip in voltage. In many cases a

*This article concludes a series of twelve articles which began in August 7, 1943, issue of "Electrical World."

HENDY GEARS PUT THE TEETH IN POWER



Hendy engineers and builds a complete range of special speed reducers and speed increasers.



Small hobbing machine cutting 18.3 inch reduction gears for 300-K.W. turbo-generator. *At right,* assortment of pinions for various geared turbine units.

Hendy gears today are putting the "teeth" in the power that drives the greatest merchant fleet of all time—the American Merchant Marine—over all the oceans of the earth toward inevitable victory.

Soon Hendy gears will be available for rubber mills, paper mills, mines, factories, the countless industrial units that will rebuild the world of tomorrow. From new skill and increased capacity developed in war, Hendy will be able to supply a complete line of gears in all sizes up to 180" diameter and for any power capacity. High load capacity is a requirement of marine gears. Hendy industrial gears measure up fully to the standards set by Hendy marine gears.

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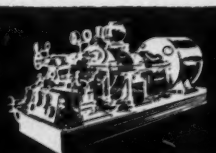
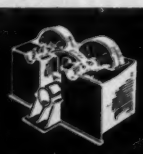


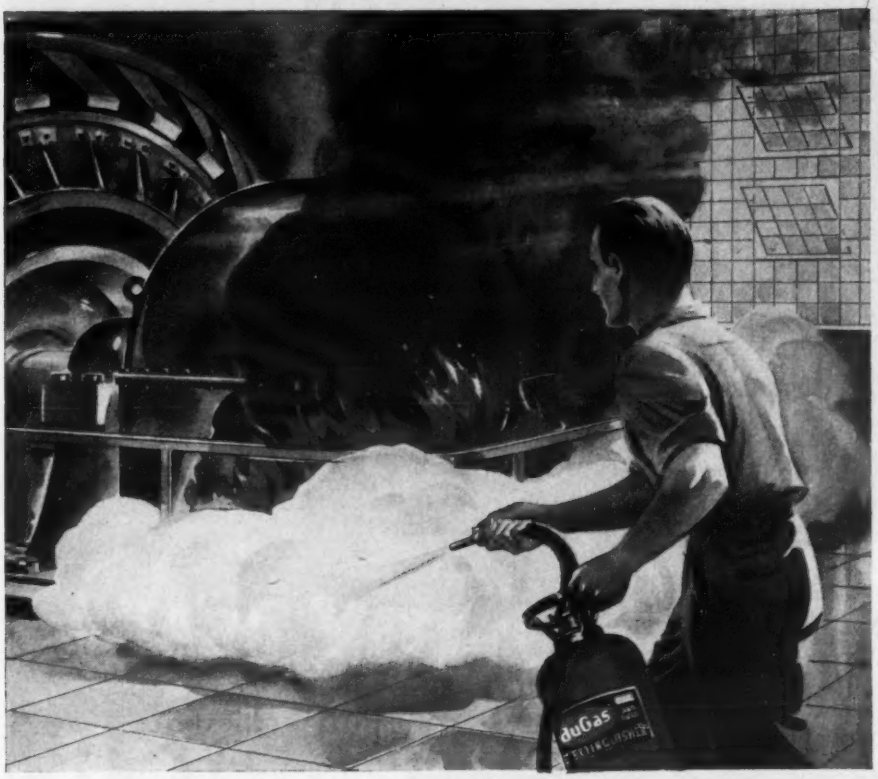
TURBO-GENERATORS



REDUCTION GEARS

STEAM TURBINES

DIESEL ENGINES



Knocks out the Fire...

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When fire strikes electric power equipment, there's no substitute for the *faster* fire-killing action of Plus-Fifty duGas.

For while it gives fire a quick "K.O.," costly equipment not damaged by fire can't be harmed by Plus-Fifty duGas—a non-conductor of electricity. This remarkable dry chemical hurts nothing but fire!

NEW FIRE-KILLING SPEED

Plus-Fifty duGas brings an entirely new concept of fire-killing speed—a fact proved by hundreds of practical fire tests.

Safer, too, because the greater fire-smothering action of Plus-Fifty duGas means reduced danger from flashbacks.

Plus-Fifty duGas Dry Chemical is available for immediate delivery. Write today for all the facts about Plus-Fifty duGas and priority information regarding duGas Fire Extinguishing Equipment.

Approved by Underwriters' Laboratories and Factory Mutual Laboratories.

NEW PLUS-FIFTY duGas REG. U. S. PAT. OFF. DRY CHEMICAL

SEND FOR CHART showing characteristics of all types of approved hand fire extinguishers.

MODEL 150 WHEELED EXTINGUISHER

DUGAS ENGINEERING CORPORATION, MARINETTE, WISCONSIN

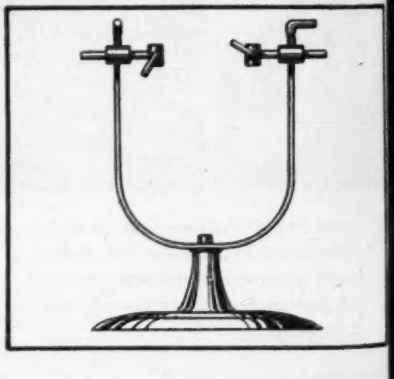
OWNED AND OPERATED BY ANSUL CHEMICAL COMPANY

loss or dip in voltage of short duration will do no harm, so that it is desirable to introduce a delay in tripping. Such a delay may be obtained by using a capacitor-time-delay device. This device is similar to the capacitor-trip device (ELECTRICAL WORLD, November 27, 1943, page 90) in that a capacitor is charged through a half-wave rectifier. The capacitor feeds through the undervoltage coil to balance the spring or weight as described above. On loss or dip in voltage the capacitor continues to feed through the undervoltage coil until it gives up its charge, thereby allowing the breaker to trip. Different delays up to several seconds are obtainable by an adjustable potentiometer which controls the voltage impressed on the rectifier-capacitor circuit. The voltage determines the charge absorbed by the capacitor, hence the time delay. Overload relays and a manual control switch may be used in conjunction with the same undervoltage coil; tripping is accomplished by shorting out the undervoltage coil through a suitable resistor.

Another method of obtaining time delay for the undervoltage trip is through use of the inductor-time-delay device. This device produces delay by use of an inductance coil with a variable magnetic circuit. However, this device has been superseded generally by the capacitor device which provides better adjustment and longer time delay.

•

Handy Meter Fixture



Able to hold a socket-type meter in any position most convenient to work on it, this fixture is a time saver in the Jackson meter test and repair shop of the Mississippi Power & Light Company. The U-frame is rotatable on the pedestal and the meter clamped in it may be held at any angle.

THE EXTRA ELEMENT

IN EVERY RCA ELECTRON TUBE

YOU can hold the tube in your hand and examine it thoroughly, but you won't see the extra element that distinguishes it.

Not until after you've put the tube to use will you finally become aware of that extra element.

It's in every RCA Electron Tube—the extra element that makes the RCA monogram worth looking for and insisting upon.

It's research. It's engineering knowledge. It's experience.

It's "know how"—the kind of "know how" that's built into every RCA Electron Tube—and it's best exemplified by the modern RCA Laboratories at Princeton, N. J., devoted almost exclusively to electronic research.

There, men skilled in the art of research seek new electronic facts.

There, the electron tube is recognized as the keystone of the whole vast structure of electronics.

There, basic facts are uncovered to assist RCA tube engineers on design, development, and production in turning out ever better and more advanced electron tubes.

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Fluorescent in Home Lighting*

By S. S. BRADFORD
Potomac Edison Company, Hagerstown, Md.

The big question for post-war consideration in the home-lighting field is what part will fluorescent lighting play in the home. Checks with a number of companies scattered throughout the United States indicate a probable fluorescent saturation of about 50 percent of all home lighting as the ultimate result through a period of years. It is believed that this development will be gradual for the average home, the early applications including the kitchen, bathroom, laundry and possibly combination fluorescent and incandescent portable lamps, the latter dependent upon the production of curved tubes, reasonably anticipated in the post-war period.

Whether the use of fluorescent in the home is gradual or rapid, it will call for careful selection and training of those individuals to be concerned with home-lighting work in the post-war period. This may also be a factor in determining the extent to which home service and home-lighting organizations should be combined. A change in all or part of the light source of portable lamps also emphasizes the need for the continued certification program if proper lighting standards are to be maintained. The need for continued support of the Better Light—Better Sight program is further emphasized by such developments.

One of the big questions concerning fluorescent in the home is power-factor correction. This is not subject to any type of policing that might have applied to commercial installations. Also, it is hardly probable that all manufacturers will gradually tend to produce power-factor corrected residential equipment, as they have done to a large extent in the commercial field. It has been estimated that a conversion of 50 percent of all residential lighting to fluorescent would result in approximately 12 percent reduction in power factor for the residential load. How serious a matter is this to sales, as well as to distribution and rate departments? While some companies seem to be quite concerned, no method of policing power-factor correction requirements or of compensating for this unfavorable factor has yet been developed. Some companies hold to the opinion that the introduction of fluorescent lighting in residences will be largely counterbalanced by increasing high power-factor equipment installations of such items as ranges and water heaters.

It is the feeling of those in our company that the future development of residential fluorescent lighting does not offer a major problem with respect to any department of the company, although it will need to be watched. The one exception to this is radio interference, which, under present conditions, may become serious with increased fluorescent use. The unfavorable phases of residential fluorescent lighting may very well be helped by future developments concerning auxiliaries and starters, and new methods or basic conditions eliminating radio interference.

*From paper to Southeastern Electric Exchange.

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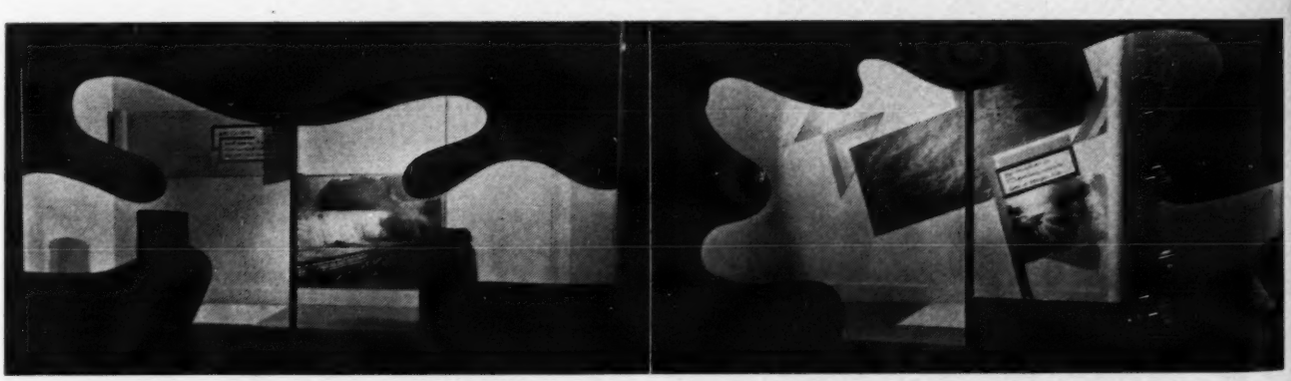
Electric Eye Controls Elevator

A West Coast barrel manufacturing plant is engaged on war contracts involving the manufacture of steel containers, or drums, using continuous-flow, high-speed methods from

Eye-Catcher Windows Tell Utility Story

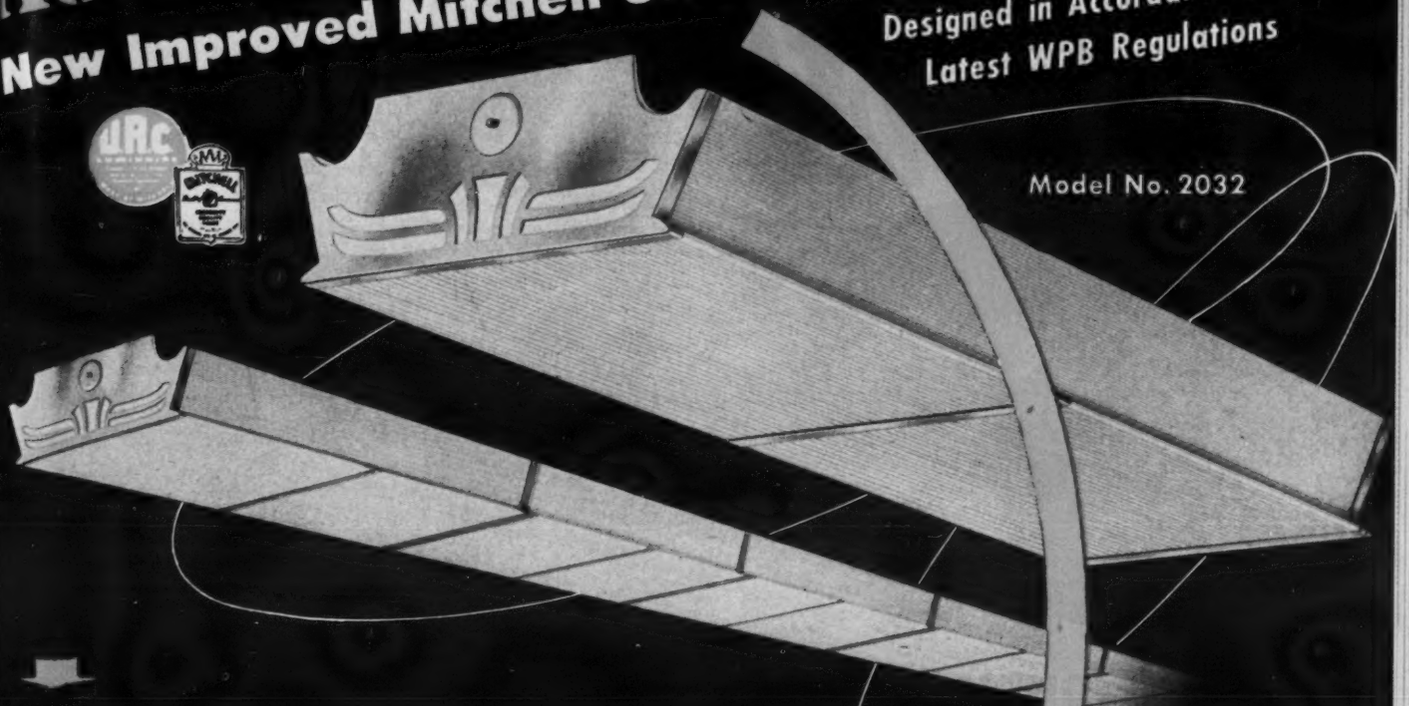


A type of window display that is "stopping them" for the Portland (Ore.) General Electric Co. is shown by the above illustrations of two of their recent ones. A few years ago it was assumed by most utilties that the public would have little interest in the technicalities of electrical equipment and service, construction details, etc. The above company, at least, is finding out differently. People seem to like such windows and will stand for a long time studying the details. Few "props" are used, in the one case of the Big Sandy dam only the ends of two wood piles.

AGAIN AVAILABLE

New Improved Mitchell U.R.C. Research Luminaire

Designed in Accordance with Latest WPB Regulations



Model No. 2032

Two years ago, Mitchell introduced the U.R.C. Research Luminaire. This great fluorescent fixture revolutionized commercial lighting, broke all sales records, became America's preferred unit. Now it is again available for offices, buildings and institutions . . . with all original U.R.C. lighting benefits, plus new Mitchell features. Combines the ultimate in high intensity illumination with low brightness! Adaptable for every type of interior—pendant or surface mounting, individual or continuous row. Takes less time to install than any other commercial fixture. Lightweight—less than 6 lbs. of metal! Same low price as when originally introduced.

Free

Send for Complete Brochure and Lighting Calculator

Get the facts! Write to your Mitchell Distributor or to us for complete brochure giving full details and lighting data on the U.R.C. Research Luminaire—and for handy lighting "Calculator" which quickly estimates the number of fixtures needed for desired maintained footcandles in given area!

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Silv-A-King "RLM" Standard Dome Reflectors

Silv-A-King "Victory" Fluorescent Units

LIGHTING EQUIPMENT

For Industrial Needs

In spite of the heavy demands of war production, Silv-A-King—specialist in industrial lighting for close to a quarter-century—is regularly filling priority orders for both fluorescent and incandescent lighting equipment. Silv-A-King lighting units offer many advantages in over-all efficiency, easy installation and maintenance—and all equipment conforms to RLM and other recognized standards for high quality and efficiency.

Silv-A-King lighting service—which costs nothing extra—includes expert guidance in planning lighting layouts for maximum efficiency, flexibility, and economy. Why not discuss your lighting problems with a Silv-A-King engineer? *And send for the complete Silv-A-King catalog today!*

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FLOOD AND SPOTLIGHTS

FLUORESCENT
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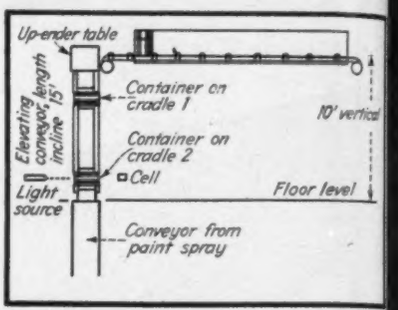
INCANDESCENT

SILV-A-KING MAKES *Light* WORK FOR YOU

the flash welding of the containers through to the spray painting and drying in an electrically heated tunnel. Coming off the paint rolls, the containers are lifted 10 ft. in vertical height by an inclined elevating conveyor before passing to the drying tunnel. An electric eye installation is employed effectively to control this elevator.

The elevator has four cradles to receive the containers, which latter are carried up in a horizontal position and turned up on end by a special mechanism before passing to the drying tunnel slat type conveyor. Formerly, a trip lever was installed on each of the four cradles, which oper-



SCHEMATIC DRAWING showing location of electric eye in connection with inclined elevator in paint spray and drying line

ated a limit switch. When a container landed in the cradle from the paint rolls it would operate the lever and start the ½-hp. motor which operates the elevator. There was trouble in this method, however, because the wet paint dripping from the containers would gum up the mechanism and render it inoperative until cleaned. The electric eye has eliminated this trouble altogether.

The source of light is located on one side of the elevator and the cell on the other, so that the container, when it falls into the cradle, interrupts the beam, acting to start the elevator motor. When cradle No. 1 has gone part of the way up a dog on the cradle operates a limit switch to stop the motor just as cradle No. 2 has come into position to receive a container, similarly with cradles 3 and 4 in sequence.

The containers come off the paint rolls at the rate of six a minute, or ten-second intervals. This is the time required for the elevator to go up the last one-third of the distance, for the upender to perform its function and for another cradle to come into position for receiving.

Obviously, as the plant superintend-

Another "Retail-Minded" Program from Kelvinator

A SIMPLIFIED POST-WAR PLANNING KIT

The First Complete and Usable Plan of Action Offered Appliance Retailers . . .

very day brings us closer to that time hen electric appliances will again be ailable for retail sale. This new Post-ar Planning Guide can be of tremendous sistance to Kelvinator retailers in or-nizing for both the sudden, immediate st-war appliance demand and the long-ll business of the years to come.

ovides a Framework to Build on . . .

his Kelvinator Post-War Planning Guide a practical, down-to-earth pattern for ganizing a retailer's own operation, a mework for his own facts and figures. brings up direct questions and tells how go about finding the answers. The result n be a factual means of selecting the rchandise to sell, the volume to plan on getting, the sales organization required, and the selling space needed.

Covers Post-War Appliance Problems

Every retail problem can be organized under one of the seven main headings found in the Guide . . .

1. **The Market**
2. **The Appliances to Sell**
3. **Store or Appliance Department**
4. **Selling Organization**
5. **Advertising and Promotion**
6. **Creative Selling**
7. **Replacement Business**

Sound answers to problems under all of these, can be arrived at through the procedure set up in this amazingly simple planning kit.

A Constant Up-To-Date Record of Post-War Topics . . .

Planning for peace prosperity is a continuous job. There are 12 indexed folders in the kit in which the retailer can keep an active ready-reference file on reprints of articles, statistics, literature; in fact, everything that may have a bearing on post-war business.

Another Result of "Retail-Minded" Action in Wartime . . .

This Post-War Planning Guide is another convincing piece of evidence of Kelvinator's consistent "Retail-Minded" Action in Wartime! Kelvinator retailers may obtain the Post-War Planning Guide at no cost, upon request to their local Kelvinator Zone or Distributor.

The men and women of the Propeller Division of Nash-Kelvinator Corporation have been awarded, and proudly fly and wear, the famous Army-Navy "E" for high Achievement in War Production.

LOOK AHEAD WITH KELVINATOR

DIVISION OF NASH-KELVINATOR CORPORATION

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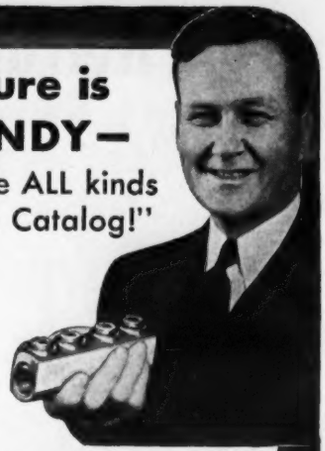

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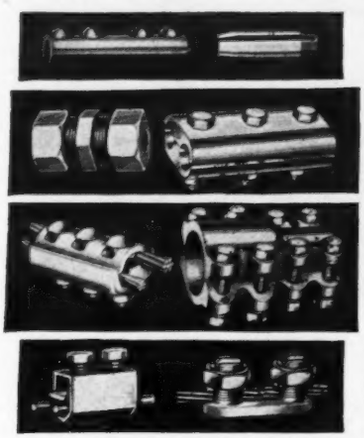
For any good Straight or Parallel Connector, *see the* **COMPLETE** *line*

These illustrations can only suggest the wide variety in the Penn-Union Catalog . . . a *complete* line of Bolted Straight Connectors and Reducers . . . Screw type . . . Split Sleeve type . . . Shrink fit . . . Universal Parallel Clamps . . . E-Z Connectors that take a wide range of conductor sizes.



Also . . . the most complete line of Service Connectors, Tee Connectors, Cable Taps . . . Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Terminal Lugs.

Penn-Union connectors are the first choice of leading utilities, industrials, electrical manufacturers and contractors—because they have found that *"Penn-Union" on a fitting is their best guarantee of Dependability.*

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

ent pointed out, another plan might be to have one electric eye to start the motor and another two-thirds of the way up to stop it. But the single beam, coupled with the limit switch as described, is simpler and operates with entire satisfaction.

•

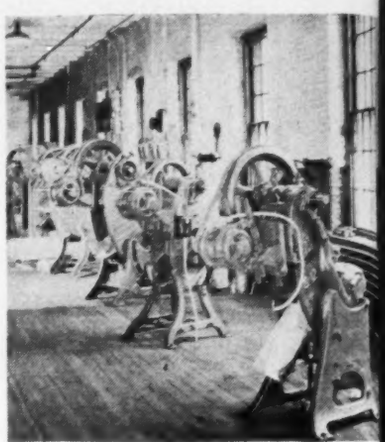
Revamped Motor Drive Speeds Production

Modernization of an Eastern metalworking plant now busy in war materiel production in connection with power supply and revamped motor applications increased manufacturing output 15 percent, saving over one hour in each eight-hour shift. The industrial engineering staff of the local utility surveyed the plant prior to the changes made in co-operation with the manufacturer. Originally the factory purchased electrical energy for the operation of spot welders, 575-volt a.c. motors and auxiliary lighting. An old reciprocating engine-driven generating unit supplied power to about 415 ft. of line shafting sectionalized on different floors and belted to machines producing over 500 different items formed mainly from parts stamped on punch presses.

The original system lacked flexibility in peacetime and, had the layout been continued until the war effort approached its maximum, would have been a severe handicap to making rapid and frequent adjustments in production equipment. Before the modernization the cost of operating the old steam plant was $3,581 per year, composed of coal (240 tons), $1,780; engine maintenance, $200; labor of engineer, $1,500; boiler insurance, $26; miscellaneous, $75. The utility power sales staff figured the increment cost of power to be purchased to meet all requirements at $2,373, leaving a net annual saving of $1,208. Further savings by shutting down the boilers in warm weather and supplying process steam from automatic oil-fired equipment totaled $718. With central station service the steam pressure was dropped to 15 psi., tending to extend the boiler life.

The major improvements effected as a result of the survey included the application of 14 a.c., 575-volt motors aggregating about 85 hp. to various drives; the installation of eight distribution transformers at important points to permit the existing circuits to handle 45 kw. in additional lo with minimum rewiring; stepping the intensity of illumination from to 24 ft.-candles by the installation 200 new Wheeler R.L.M. fixtu mounted on 15-ft. centers, and usi 300-watt lamps; changing about machines to individual motor drive removal of old line shafts and redu tion of former friction losses; rea rangement of groups drives to ser about 50 machines from five line sha sections much shorter than befor and relocation of various machines reduce doubling back in productio material flowage, to provide mo space for handling bar and strip stock

Most of the presses required motor of 2-hp. or 3-hp rating, and in ge eral these were attached to the frame of the driven machines by welde structural platforms bolted to th backs of the presses. To insure suit



BATTERY of punch presses re-equipp for individual motor drives with V-b and push-button controls was set on agonal axes to increase space for ha dling longer stock sections

able adjustment, all such motors wer mounted on belt-tensioning bases. Th former press speeds were retained necessity, and motors running at 90 or 1,200 r.p.m. fitted the case. Push button control from the machines wa provided. Virtually all presses nor mally may produce from 10 to 2 kinds of parts in a year. The revise layouts of individual and group drive were made to approximate the mo favorable service and represente compromises between the two type to meet the maximum requirement Sections producing galvanized can were conveniently group-driven i view of the sequence operation When post-war production problem are faced the electric drive will yie many advantages.

WOLFE & MANN

OUTSTANDING

in the field of low cost, high-performance Switchgear, Panels and Switch Boards •• No contract too BIG none too small to receive the personal attention of our skilled Electrical Engineers. • Write for Catalog

These Projects
ARE OUR REFERENCE

BETHLEHEM STEEL COMPANY
CULPEPER POWER PLANT, CULPEPER, VIRGINIA
NAVY HIGH POWER RADIO STATION, ANNAPOLIS, MD.
UNIVERSITY OF VIRGINIA
WEST VIRGINIA PULP AND PAPER COMPANY

U. S. GOVERNMENT:
BUREAU OF SHIPS
DEPARTMENT OF COMMERCE (LIGHTHOUSE SERVICE)
PANAMA CANAL
PEARL HARBOR, T. H.
U. S. TREASURY BUILDING, WASHINGTON, D. C.

WOLFE & MANN
Manufacturing Company

SWITCHGEAR ★ SWITCHBOARDS ★ PANELS
28TH and SISSON STREETS ★ BALTIMORE, MARYLAND

"Electric Utilities are helping promote better use of our available Foods"

Roy F. Hendrickson

ROY F. HENDRICKSON, DIRECTOR
FOOD DISTRIBUTION ADMINISTRATION

No. 11 IN A SERIES

Spotlighting six of the many utilities who are already aiding America's Nutrition Program

In helping meet the many problems of food distribution caused by shortages and surpluses, electric utilities are doing a standout job. At Health-for-Victory Club meetings throughout the nation, utility home economists are showing thousands of homemakers how to make the most of available foods. By focusing attention on the more plentiful foods they work toward a balanced food distribution.

Over 1,700 war plants and other organizations are now using the Health-for-Victory nutrition program, in many cases with the active support and sponsorship of the local utility. This program is flexible, and can be developed locally around the H-for-V Monthly Meal Planning Guide.

Electric Utilities are invited to use the Health-for-Victory program to help make Food Fight for Freedom. It is immediately available and fits perfectly into the plan recommended by the Edison Electric Institute and the Council of Electric Operating Companies for co-operation with the Food Distribution Administration.

West Penn Power Co.

UTILITY EMPLOYEES BENEFIT FROM H-FOR-V MEAL PLANNING GUIDE

W. J. Edmunds, Welfare Director of West Penn Power Co., starts distribution of another issue of the popular monthly Meal Planning Guide to about 3,000 employes.

PRODUCE AND CONSERVE — SHARE AND PLAY SQUARE

FOOD FIGHTS for freedom

Health-for-Victory

Iowa-Illinois Gas + Electric Co.

HOME CANNING WAS TIMELY SUBJECT OF THIS PACKED MOLINE, ILL. MEETING

Mrs. Margarete Crooks, utility home economist, tells eager H-for-V Club members how to can their Victory Garden harvests.

TO MAKE THE CLUB "CLICK" → INDIANA GROUP DEPENDS ON PLANNED ACTION

Utility executives and officials of Posey County Office of Civilian Defense meet to plan the next H-for-V Club meeting.

Eastern Shore Public Service Co.

UTILITY EXECUTIVE AND HOMEMAKER EXCHANGE IDEAS ON H-FOR-V MEAL PLANNING

The best way to find out how enthusiastic homemakers are about H-for-V planning is to go right into their homes and ask them. That's what Mr. J. C. Landon is shown doing in the above picture.

Southern Indiana Gas + Electric Co.

Kentucky + West Virginia Power Co.

KENTUCKY CLUB MEMBERS FILL ROOM TO LEARN H-FOR-V FOOD FACTS

Scores of wives of Ashland Oil & Refining Co. employes turn out regularly to get valuable pointers on how to solve current food problems from Mrs. Helen Eaton, capable utility home economist.

Toledo Edison Co.

GETTING SET FOR DISTRIBUTION OF LATEST H-FOR-V MEAL PLANNING GUIDE

Utility executives talk over plans for distributing the monthly H-for-V Meal Planning Guide to company employes thus helping make Food Fight for Freedom.

A CONTRIBUTION TO AMERICA'S WAR EFFORT BY

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Does the *paper* embodied in your product or packaging get the same degree of analytical engineering that you give to other component parts of that product? . . . or are you merely attempting to adapt some "ready made" paper that has "approximately" the properties you think are needed?

Do you call in a qualified paper specialist who is thoroughly informed on all the potentials of paper . . . who can engineer and create special papers to do the job you want paper to do on your processing machines? Or is there a "vacant chair" at your product planning conferences, in which a Mosinee paper technician could function and create the paper best suited for your specific needs?

The Mills of Mosinee are qualified by experience and facilities to fill that "vacant chair" . . . to cooperate with your organization in the proper engineering of special paper to improve not only the utility of your products, but also to speed up your processing operations!

MOSINEE PAPER MILLS CO. MOSINEE, WISCONSIN

Please address your letter "Attention Dept. B"

MOSINEE PAPER MILLS COMPANY

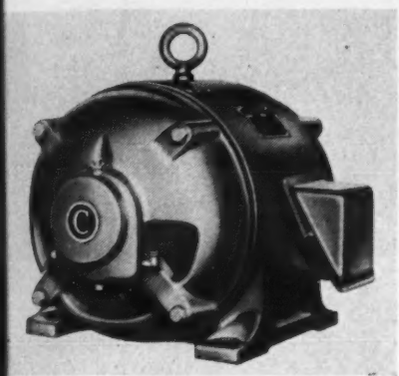
MOSINEE • WISCONSIN

Essential Paper Makers

NEW EQUIPMENT

Motor

New motor has upper half of end bracket closed to minimize possibility of dripping liquids or falling solids entering the vital parts. Two fans located behind the bear-



"Form J" general-purpose, open rated induction motor; sizes from 1½ to 15 hp. **Century Electric Co.**, 1806 Pine St., St. Louis, 3, Mo.

ng brackets draw cooling air through the bearing bracket openings, around the bearings, across the windings and to the air passages between the outer surfaces of the magnetic core and the frame, the heated air being expelled through openings at the side and bottom of the frame.

•

Cleaner

"Running Gear" hydrocarbon cleaner. **Technical Process Division, Colonial Alloys Co.**, Colonial Philadelphia Bldg., Philadelphia, 34, Pa.

An emulsifiable type cleaner has been developed for quick removal of oils and solid particle dirts and greases, especially those which are very hard or caked on, such as accumulations on underframes, driving gear, motor blocks, brake rigging on trucks, buses and tractors. The mix is one part added to three or up to ten parts of kerosene, depending upon the severity of the cleaning job. It may be used at room temperature or up to 90 deg. F.

•

X-ray Unit

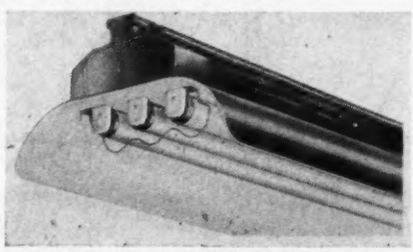
"Searchray Model 150" self-contained X-ray unit; 220 volts, single phase, 60 cycles; radiographic compartment is 25¾ in. high, 35 in. long, 25 in. deep. **Industrial Electronics Div., North American Philips Co., Inc.**, 100 East 42d St.

Second of a series of X-ray units for industrial use operates with a fixed milliamperage over the entire kilovoltage range. It has a continuous kilovolt regulator which permits adjustment during viewing operation at any point from zero to 150 kv., so that, depending on density and thickness of the part under observation, clarity on the fluoroscopic screen can be obtained. The regulator has four 11-in. linear scales, one each for KvP, aluminum, brass and steel. An electrical interlock, which interrupts the circuit while the radiographic compartment is open, is said to eliminate any danger to the operator from x-radiation.

•

Lamp Guards

To prevent lamps that are accidentally left in, or jarred into, an unlocked position from failing, a safety guard is available having clips made to slide over the material thickness of the average non-metallic reflector. When used on steel reflectors, the clips can be pinched, or squeezed together, so that they will remain in place. Each lamp is said to be cradled and restrained so it cannot shift downward enough to clear the lampholders or sockets.



Retaining safety guards; for two and three 40-watt and two 100-watt fluorescent lamp fixtures. **Wheeler Reflector Co.**, 275 Congress St., Boston, Mass.

•

Silver Babbitts

"No. 367" and "No. 397" silver-lead babbitts; compressive strengths at 1 percent deformation 7,250 and 6,000 psi., respectively; pouring temperature 630-680 deg. F. **National Bearing Metals Corp.**, 4930 Manchester Ave., St. Louis, 10, Mo.

Silver alloyed with a properly balanced lead base babbitt is a creation by the shortage of tin due to the war. The two types are said to have the same bondability and corrosion resistance as that of tin-base babbitts and retain hardness at operating temperatures without squeezing out.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Spotlight

New spotlight is designed to provide glareless illumination of sufficient intensity for an arc welding operator to see his work distinctly through the dark lens of a weld-

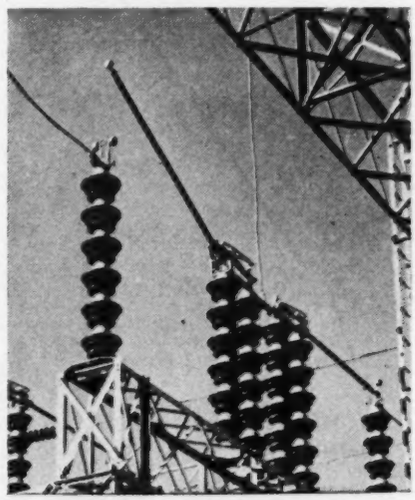
"Cat 89X391" arc-welding spotlight; 120 volts; consists of three 300-watt reflector spot lamps surrounded by a circular shade; controlled by a foot-operated switch. **General Electric Co.**, Schenectady, N. Y.

ing helmet, prior to striking the arc. It is mounted on an upright, telescoping metal standard and set in an 18½-in. diameter, 30-lb. cast-iron base. Lamps are mounted in adjustable porcelain holders, so that the area covered by the light beam can be increased, from a single, sharp spot 7 in. in diameter to a clover-leaf shaped pattern 17 in. across at its widest point.

•

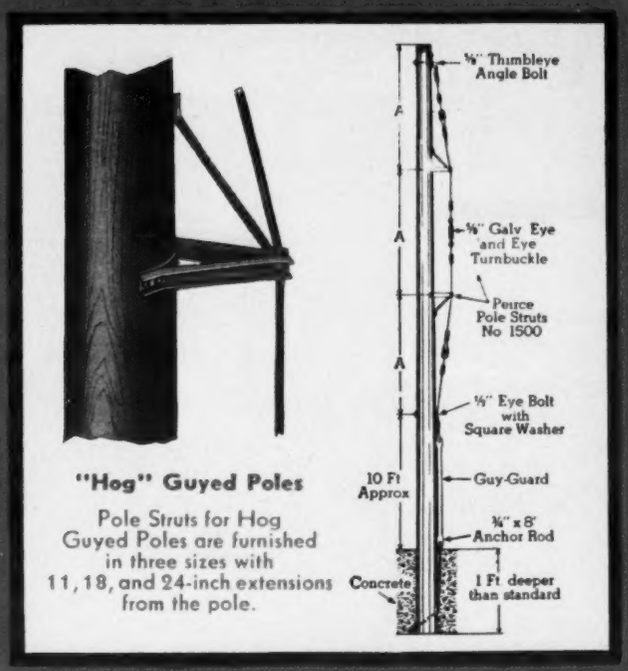
Disconnect Switch

Designed for ice conditions, the switch is stated to break ice quickly by the movement of the operating handle which first rotates the blade and splits the ice at both contact and hinge before the blade starts moving in its vertical arc. Its chisel-like blade cuts into the ice when closed from an open position.



"Type TW-3" disconnect switch; capacity 1,200 amp., 196 kv. **Pacific Electric Mfg. Corp.**, San Francisco, Calif.

HUBBARD HARDWARE


⅝" Thimbleye Angle Bolt
⅝" Galv Eye and Eye Turnbuckle
Pierce Pole Struts No 1500
⅝" Eye Bolt with Square Washer
10 Ft Approx
Guy-Guard
¾" x 8' Anchor Rod
Concrete
1 Ft deeper than standard

"Hog" Guyed Poles

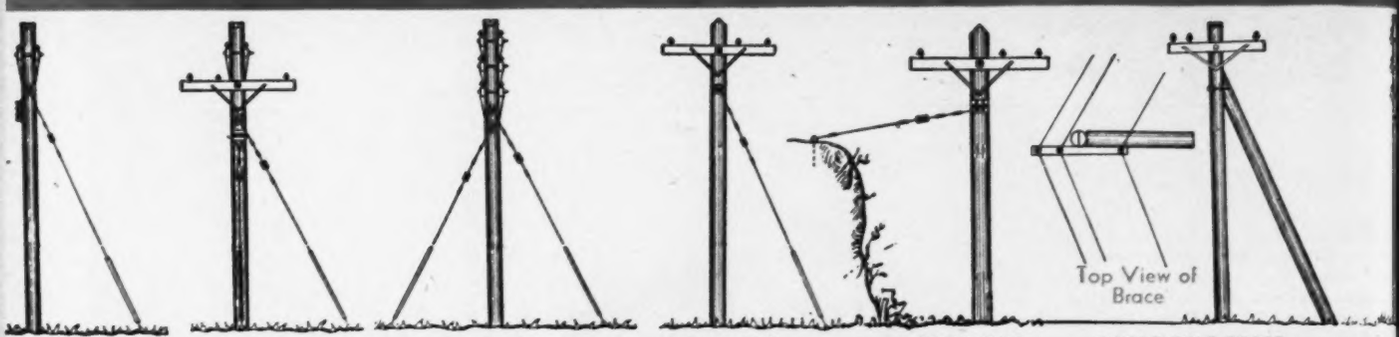
Pole Struts for Hog Guyed Poles are furnished in three sizes with 11, 18, and 24-inch extensions from the pole.

No. 6012
Angle Thimbleye Bolt
Furnished in sizes from ⅝-inch to 1-inch Diam. and 8-inch to 18-inches in length.

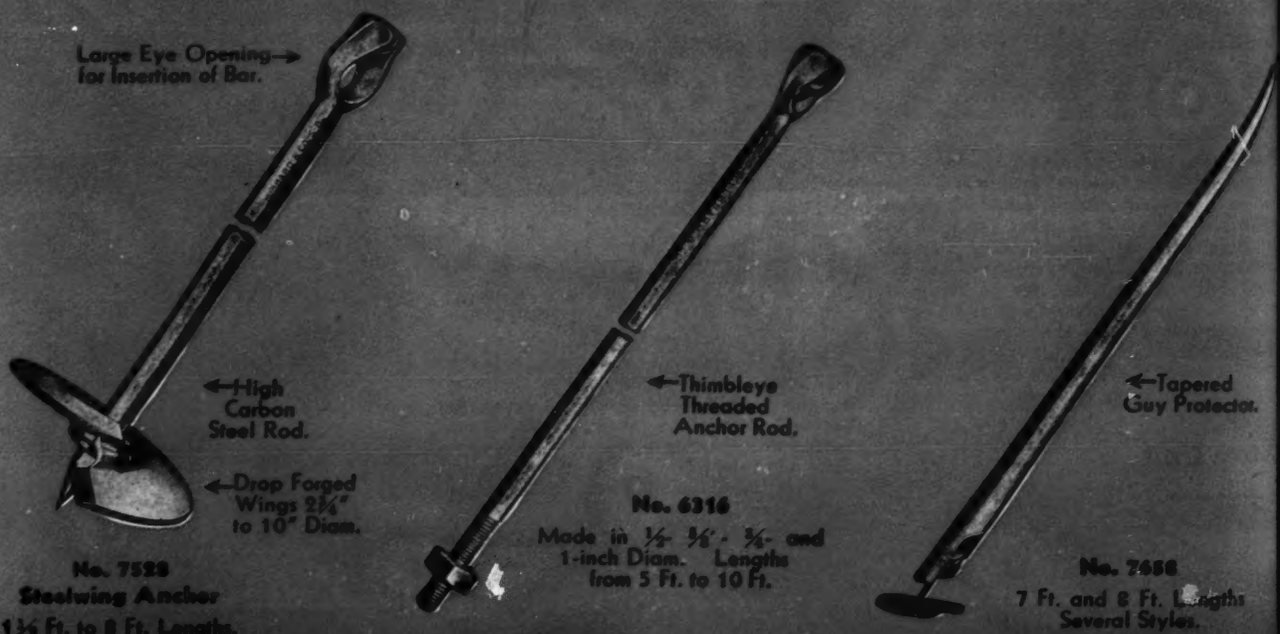
←For ½" Lags.
←For ⅝" Thru-Bolt
←For Guy Bolts up to 1 ⅛" Diam.

No. 8891 Load Plate
Furnished in several sizes and styles, curved and flat.

No. 7510 Thimbleye
Sizes for ½- ⅝- ¾- and bolts, Double and Triple



TERMINAL GUY | CORNER GUYS | LINE GUYS | SIDE GUY | ROCK GUY | SINGLE POLE BRACE


Large Eye Opening→ for Insertion of Bar.
←High Carbon Steel Rod.
←Drop Forged Wings 2¾" to 10" Diam.
←Thimbleye Threaded Anchor Rod.
←Tapered Guy Protector.

No. 7528
Steelwing Anchor
1½ Ft. to 8 Ft. Lengths.

No. 6316
Made in ½- ⅝- ¾- and 1-inch Diam. Lengths from 5 Ft. to 10 Ft.

No. 7656
7 Ft. and 8 Ft. Lengths
Several Styles.

"Hang the Load on Hubbard Hardware"

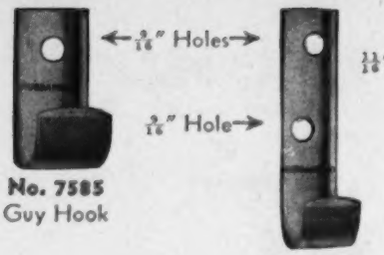
FOR ALL TYPES OF GUYS

. 7575 Strain Plate

yles are plain and for Moulding. Also with Guy Hooks attached.

lo. 7461 Guy Clamp

e, two, three and four-bolt es for all standard strand.



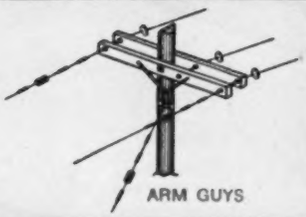
No. 7585
Guy Hook

No. 7586

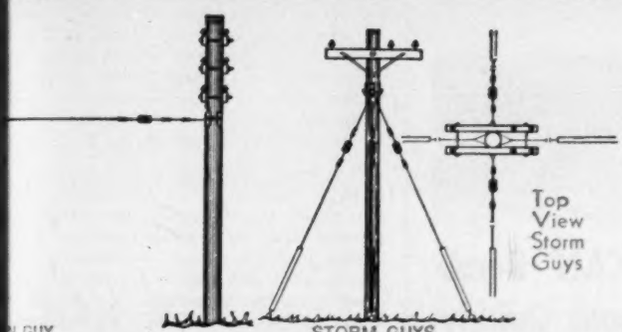
No. 6004
Arm Guy Attachment.

No. 6001
Storm Guy Attachment.

No. 9786 Double Arming Eye Bolt
5/8" and 3/4" Diameter—16" to 20" Lengths.

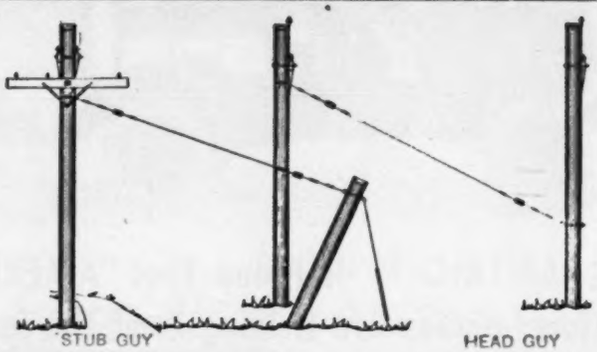


ARM GUYS



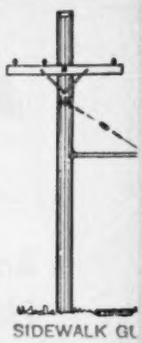
N GUY

STORM GUYS



STUB GUY

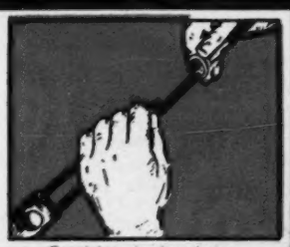
HEAD GUY



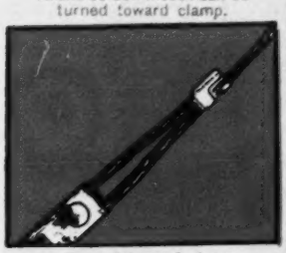
SIDEWALK GU

No. 7454
Servisleev

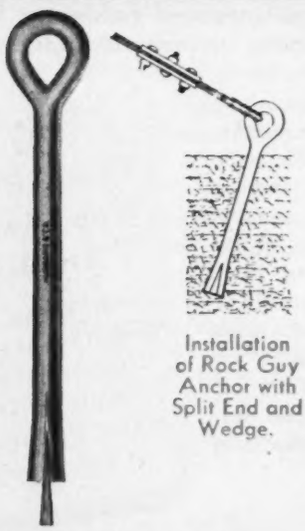
Sizes for Strand from 3/16" to 1/2" Diameter



Servisleev is placed over strand so bell mouth can be turned toward clamp.



—Turned toward clamp bell mouth is driven over loose end of strand.

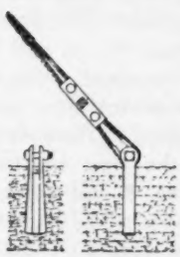


No. 7547 Rock Anchor

Installation of Rock Guy Anchor with Split End and Wedge.

No. 7595
Guy Thimble

Sizes for all standard strand and Anchor Eyes.



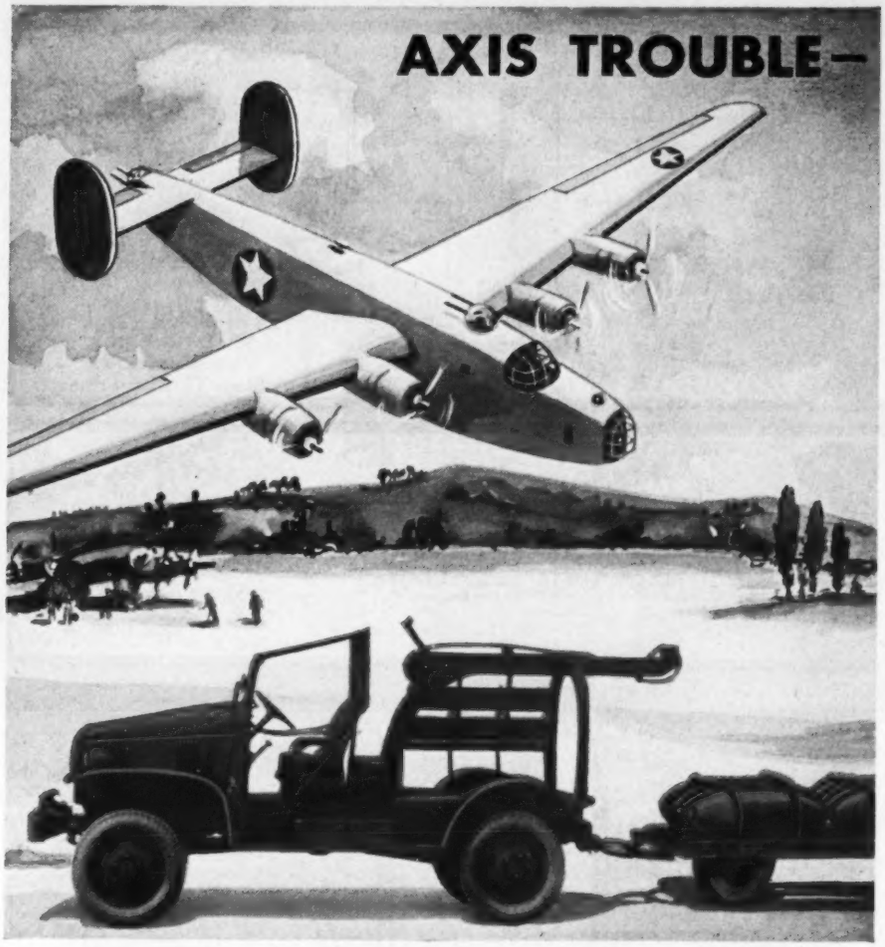
No. 7545
Wedge and Shim Type Rock Guy Anchor.

HUBBARD

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND . . . CALIFORNIA . . . CHICAGO

IN FOR ANOTHER LOAD OF



And "AMERICAN" Is Proud That "AMERICAN" Bomb Platform Bodies Are Helping Load The Bombs Quickly

In war and in peace speed and efficiency in the handling and transportation of heavy material is mighty important • "American" Bomb Platform Bodies like that shown above, specially designed and constructed for the U. S. Ordnance Department are in use today on many airfields, facilitating the transportation and loading of bombs on to our bombers • For many years "American" Equipment has been serving Utilities by helping to increase the speed and efficiency of the line construction and maintenance crews • Of course, the first and primary job for all of us today is the winning of the war. While "American" is devoting itself today to production for Uncle Sam, still we are planning for Victory Day and the post war needs • Immediately after peace we will be able to deliver, as fast as we can get chassis, equipment like that produced just before hostilities and we are also planning for many new developments.

Some Reasons Why "Americans" Are TOPS:—

Correct Design • Superior Quality Construction • Comfort • Convenience • Safety • Endurance • Low Operating Cost • Fine Appearance

THE American COACH & BODY CO.

PUBLIC UTILITIES EQUIPMENT FOR MOTOR VEHICLES

TECHNICAL LITERATURE

PLASTICS—The October, 1943, issue of "A.S.T.M. Standards on Plastics" contains 85 specifications, tests and definitions. Copies of the 445-page publication can be obtained from the American Society for Testing Materials, 260 South Broad St., Philadelphia 2, Pa., at $2 each.

TEXTILE MATERIALS—The 1943 compilation "A.S.T.M. Standards on Textile Materials" contains 78 specifications, tests and definitions as well as related information and data on calculation of number of tests for textile materials—asbestos tape, leather, fiber products, jute, glass, rayon, silk and wool, a yarn number conversion table and humidity tables. Copies of the 458-page publication is obtainable from American Society for Testing Materials, 260 South Broad St., Philadelphia 2, Pa., at $2.25 each.

TUNGSTEN ELECTRODES—Application of the electrodes for atomic-hydrogen, helium and argon arc welding, their physical properties, dimensions and current range in amperes are listed in Bulletin No. 154, which may be obtained from Callite Tungsten Corp., 540 39th St., Union City, N. J.

RECTIFIERS — Electronic principles of mercury-arc rectification, operation of an ignitron, typical connection diagrams, curves on comparative efficiency of power conversion units, are contained in a bulletin entitled, "Ignitron Mercury-Arc Rectifiers" for 501 kw. and higher ratings, 25 to 900 volts. The publication, No. GEA-3706, can be obtained from the General Electric Co., Schenectady, N. Y.

"LIGHTING SPECIFIC FOR RAILROADS," a 22-page bulletin, lists foot-candle values considered good practice for interior and exterior areas for passenger stations, freight houses, multiple storage warehouses, offices, roundhouses and engine service plant pits, machine shops, locomotive and freight car repair shops, as well as for underpasses, outdoor crane ways, watchman's gates, paint shops and protective lighting. Numerous sketches for lighting unit placements are included. Copy is available from Engineering Department, Holophane Company, Inc., 342 Madison Ave., New York, N. Y.

"INSTRUCTIONS FOR TORCH BRAZING" with four silver alloys outlines and illustrates seven standard steps for the process. The two-page instruction sheet is made available by Handy & Harman, 82 Fulton St., New York 7, N. Y.

TIMBER CONNECTOR CONSTRUCTION—Charts on load values, spacings, etc., covering use of Teco connectors, recommended cambers for standard trusses, approximate weights of various timber connectored roof trusses, and a table of dimensional properties of American standard-sized lumber are contained in "Design Manual for Teco Timber Connector Construction." The 40-page book, 1943 edition, has been issued by Timber Engineering Co., 1319 Eighteenth St., N. W., Washington 6, D. C.

"PACKAGING PAYS OFF" is the title of bulletin B-6285, containing a monogram to select the correct air circuit breaker for applications of standardized load center unit substations, a tabulation of load break switches and load break switch-fuse combinations, and a description of the unit substations of 100 to 2,000 kva. capacity. The bulletin can be secured from Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.

SYNCHRONOUS STARTERS
FOR
220-550 VOLT MOTORS

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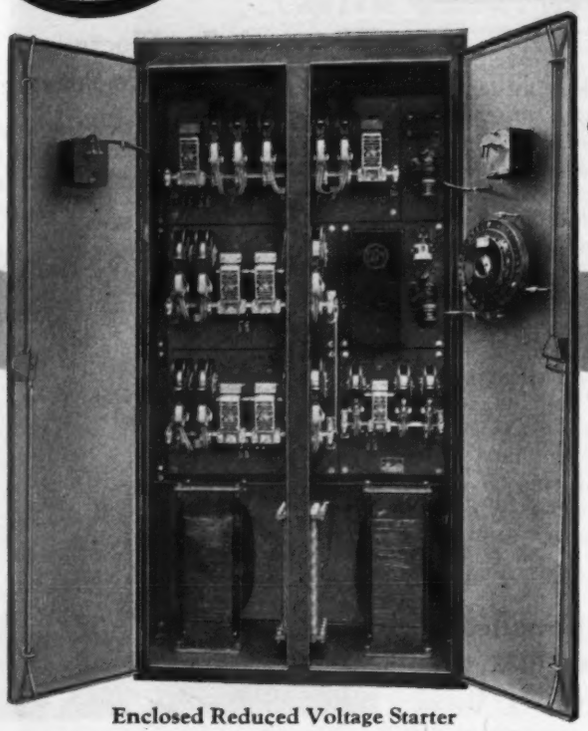
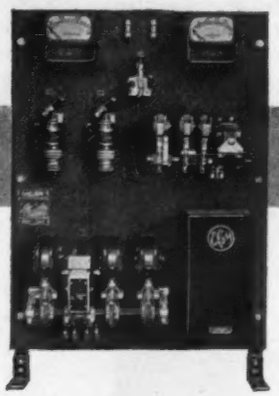
Companion Line to Bulletin 1075-A, Oil-immersed Starters



Enclosed Reduced Voltage Starter



Standard Open Starter for
Full Voltage Starting

AIR-BREAK TYPE WITH *LINE-ARC* CONTACTORS

D-C AUTOMATICALLY APPLIED
TO FIELD BY ELECTRONIC RELAY

Above view shows field-switching contactor at right. This has one normally-closed and two normally-open contacts. At the left is easily adjustable, electronic-type relay which applies direct current to motor field to pull motor into synchronism automatically.

THESE are completely wired units, each with line and field ammeters, overload relays, mounting of exciter-field rheostat, auto-transformer (on reduced voltage starters), etc.

They are arranged for two or three phase service. Maximum ratings—(for both reduced and full voltage starting) 400 H.P., 220 volts and 800 H.P., 440 and 550 volts.

Standard features include equipment as illustrated and described above. Optional features include enclosures; disconnect switch; and when enclosures are desired for starters having this disconnect feature, space for 3-phase bus is provided at the top of the enclosure. Other options are indicating light; field-removal with automatic resynchronization should motor pull out-of-step, etc.

Complete details are given in Bulletin 1076-A. Ask for your copy to-day.

EC&M COMPLETELY AUTOMATIC — SYNCHRONOUS STARTERS

THE ELECTRIC CONTROLLER & MFG. CO., Cleveland 4, Ohio

NEWS ABOUT PEOPLE

Miss Sheridan to Retire from Detroit Edison

Retirement of Sarah M. Sheridan, vice-president of Detroit Edison Co., and for many years its sales manager, has been announced by Alfred C. Marshall, president. While Miss Sheridan will not formally retire until March, 1944, she

will, at the beginning of the year, relinquish her duties and responsibilities. Angus D. McLay is now responsible for the sales department, having been appointed sales manager in 1938 and elected a vice-president in 1943. Roy T. Duncan is commercial superintendent of the sales department.

"Detroit, Miss Sheridan and the Detroit Edison Co. all grew together," said Mr. Marshall, in commenting on Miss Sheridan's retirement. "I have worked closely with Miss Sheridan for many years and know her first as a fine and gracious gentlewoman and secondly as a business woman, outstanding in the city and our whole industry in the technique of handling people and gaining their respect and co-operation. Miss Sheridan is largely responsible for the public respect and trust that this company has gained for itself, not only in our service area but in the industry.

"Miss Sheridan's strong belief more than 20 years ago that farmers, as well as city people, needed and should have electric service drove us to new engineering adventures in farm-line construction and supply. Her insistence on continuous service, easy lamp renewals, fuse service and low rates are all taken for granted today, but were bold pioneer steps 40 years ago when Miss Sheridan was first responsible for the company dealing with customers," Mr. Marshall recalled.

Employees of the sales department recently presented to the company a portrait of Miss Sheridan, who is widely known in civic and electrical utility fields. She was one of the first women in this country to be elected to an important executive position in a large business, when, in 1921, she was made a vice-president of the company.

•

W. J. Massey Appointed Lamp Sales Manager

Appointment of William J. Massey as general lamp sales manager of the Westinghouse Lamp Division with headquarters in Bloomfield, N. J., has recently been announced. In his new position, Mr. Massey will have charge of all lamp sales activities of the lamp division, including district sales offices; the illuminating engineer-

ing, commercial engineering and advertising departments.

Mr. Massey has been associated with the commercial activities of the lamp division since 1907. In 1914, he was appointed assistant to the sales manager and in 1923 became northeastern district manager with headquarters in New York.

Appointed assistant sales manager in 1938, Mr. Massey entered the Bloomfield Works in 1941, when sales headquarters for the lamp division were transferred there from New York.

•

Wiegand Co. Elects Fleming Vice-President

Bruce A. Fleming has been elected vice-president in charge of sales of the Edwin L. Wiegand Co., Pittsburgh, Pa. He succeeds Ernest N. Calhoun, who

recently became president of the company.

Mr. Fleming has been associated with the appliance industry for the past 15 years, having been active in the appliance promotion of the National Electrical Manufacturers Association and the Modern Kitchen Bureau.

•

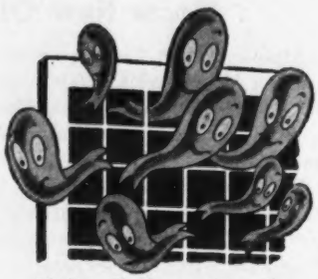
▶ HENRY E. CHAMBLISS has been named manager of the Great Falls division of the Montana Power Co., succeeding the late Clinton T. Booker.

WALTER W. R. MAY, former newspaperman, has recently purchased the Oregon City *Enterprise*, a daily newspaper located in Portland, Ore. Mr. May, in returning to the newspaper field, relinquishes his position with Portland General Electric Co. as director of public relations and industrial development.

▶ A. H. MEYER, manager of the Midland sales district of the lamp department of the General Electric Co., has been elected to serve as vice-president of the Chicago Lighting Institute, filling the vacancy created by the death of John G. Learned, vice-president of the Public

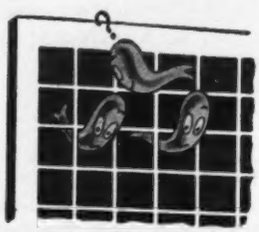
HOW *PRECIPITRON** WORKS

You get 90% CLEANER Air with ELECTRIC Air Cleaning



Uncleaned air contains dirt particles of various sizes.

Yes . . . 90% *cleaner* air than is provided by conventional air cleaners. For each ounce of dirt that "escapes" in a mechanical air cleaner, *less than 1/10 of an ounce* gets through the Precipitron. The reason for this is that the Precipitron, operating electrostatically, removes air-borne particles as small as 1/250,000ths of an inch in diameter.

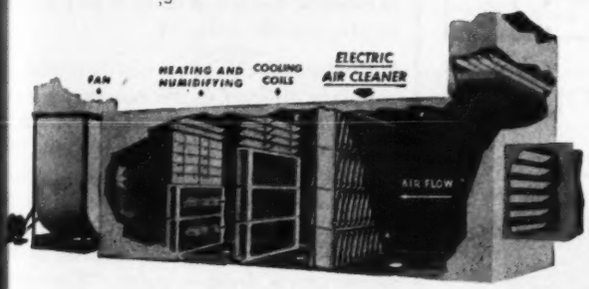


Mechanical cleaners permit small particles, or about 10% of the dirt, to "escape."

Sealed within the ventilating duct so that all air must pass through it, the Precipitron operates silently, efficiently, with no more moving parts than a storage battery. At the front of the unit (or cell), two fine tungsten wires and three grounded rods create a strong electrostatic field. As each particle of dirt passes through this field, it receives a positive charge of electricity.

Precipitron removes the *small* particles, too; is 99½% efficient (based on weight tests).

These charged particles are then carried by the air stream to *collector plates* located behind the electrostatic field. Here the dirt particles are quickly "grounded" on the oppositely charged plates. And here they stay . . . until the plates are washed down with water and the deposit flushed harmlessly down the drain.



Cross section of Precipitron installation in typical air conditioning duct.

Because Precipitron consistently removes more than 99½% of ALL air-borne dirt (measured by weight), it has given a new meaning to commercial and industrial air cleaning. For full information on Precipitron and its applications . . . for immediate use in vital war production . . . or postwar use in other fields . . . write Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, Ohio.

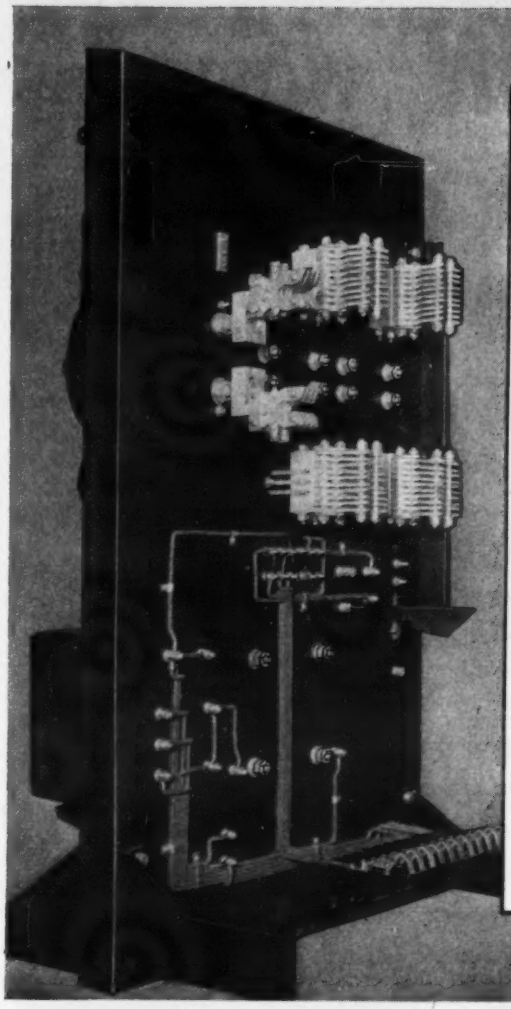
*Trade-mark registered in U. S. A.

Westinghouse Precipitron

PLANTS IN 25 CITIES ○ OFFICES EVERYWHERE

Tune in on John Charles Thomas, NBC, Sundays, 2:30 p.m., E.W.T.

Electronics at Work



PALNUTS KEEP SWITCHBOARD ASSEMBLIES *TIGHT!*

The I-T-E Circuit Breaker Company takes no chances on loosening of bolted assemblies in its switchgear. This rear view of an I-T-E 2 pole "LX" withdrawal type Circuit Breaker shows 16 places where PALNUTS are used to keep parts tight under vibration.

Specify DOUBLE-LOCKING PALNUTS *for Security!*

A switchboard cannot give continued, trouble-free operation unless all parts stay tight in service. Because of this fact, many switchgear manufacturers safeguard bolted assemblies with Double Locking PALNUTS . . . and users specify them when buying.

PALNUTS are single thread, tempered spring steel locknuts which are easily, quickly applied on top of the regular nut. Their unfailing double locking action holds tight under severe vibration and stresses. PALNUTS require but 3 bolt threads space, are light in weight, low in cost, may be removed and re-used, assure perfect conductivity on electrical connections. They are also widely used on steel towers, wood pole lines, fittings, connectors, disconnects, transformers, substation and other electrical equipment.

Double Locking Action

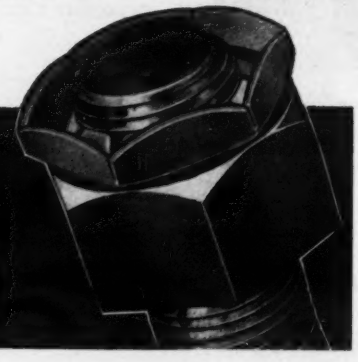
When the PALNUT is wrench-tightened, its arched, slotted jaws grip the bolt like a chuck (B-B), while spring tension is exerted upward on the bolt threads and downward on the regular nut (A-A), securely locking both.

Add PALNUTS to present equipment—specify them on new equipment. Write for Palnut Manual No. 1, giving full particulars.

THE PALNUT COMPANY
51 Cordier St. Irvington, N. J.

Used Today on Aircraft, Tanks, Jeeps, Military Vehicles and other War Equipment

DOUBLE-LOCKING **PALNUTS**



Service Co. of Northern Illinois. Mr. Meyer also represents the General Electric Co. on the board of directors of the institute. A. H. SCHNEIDER, general sales manager of the Public Service Co. of Northern Illinois, was appointed by the officials of his company to represent the company on the board of directors of the institute, which position had also been held by Mr. Learned.

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Indiana Municipal Group Elects New Officers

Announcement has been made by the Indiana Municipal Electric Association, Inc., of the election of the following officers at its recent annual meeting in Indianapolis:

President, Glen Hayworth, superintendent Crawfordsville utilities; vice-president, Ernest Wills, superintendent Pendleton utilities; secretary, Thomas J. Burrin, manager Lebanon utilities; treasurer, Marvin E. Pogue, foreman distribution, Frankfort, and program chairman, R. W. Barkley, superintendent Frankfort utilities.

•

▶ ALBERT MILLER, St. Louis attorney, has been appointed by Gov. F. C. Donnell as chairman of the Missouri Public Service Commission, succeeding FREDERICK STUECK, now in military service. The appointment is subject to confirmation by the Missouri State Senate.

▶ CHARLES H. WEAVER has been appointed manager of the marine department recently organized by the Westinghouse Electric & Manufacturing Co. He will direct all commercial activities, including the co-ordination of marketing of the diversified products of the company that are used for marine service. As former manager of the marine section of the industrial department of Westinghouse Mr. Weaver is well known in the marine industry.

▶ ROBERT B. SHEPARD has resigned as assistant director of the conservation division of the War Production Board, Washington, to devote full time to his regular position as chief electrical engineer of Underwriters' Laboratories at its New York office. In announcing the change, Howard Coonley, director of the conservation division, said: "Since Mr. Shepard joined the conservation division in April, 1942, he has been instrumental in furthering the many conservation measures which today are in effect. Mr. Shepard's duties while he was on loan from the laboratories were to set up programs for simplifying products so as to release critical materials and manpower for the war effort. He will continue to serve as the division's repre-

Can you think of 7 better reasons for installing MILLER Fluorescent now?

Here are provable facts—facts that have caused war industry to insist upon MILLER 50 & 100 FOOT CANDLER Continuous Fluorescent Lighting Systems . . .

1 NEW, IMPROVED DESIGN of the Miller Continuous Wireway Flourescent Lighting System, constructed to comply with wartime regulations for conservation of critical materials —the same as introduced in 1939.

2 RUGGED LIGHTWEIGHT EQUIPMENT —rigid compact channels and Masonite reflectors—no reduction in lighting efficiency.

3 EXPOSED BALLAST for coolest possible operation—all wiring concealed but accessible upon removal of lightweight reflector.

4 LAMPHOLDERS rigidly mounted back-to-back for mutual stiffening and maintenance of spacing. Miller patented lamp lock also available, minimizing danger of falling lamps.

5 LOW INSTALLATION COST — savings of 30-50% again possible by use of 8 foot and 10 foot rugged double length channels—one suspension per channel section—simplified wiring in continuous rows.

6 SIMPLIFIED MAINTENANCE—ballasts, lampholders and starters readily accessible — starters located between lamps.

7 UNIFORM ILLUMINATION—the 30 to 50 or more footcandles required for war production easily obtainable from practical row spacings.

We suggest you write or wire today for complete information.

THE MILLER COMPANY • MERIDEN, CONNECTICUT

MILLER
SINCE 1844

ILLUMINATING DIVISION
Fluorescent, Incandescent
Mercury Lighting Equipment

OIL GOODS DIVISION
Domestic Oil Burners
and Liquid Fuel Devices

ROLLING MILL DIVISION
Phosphor Bronze and Brass
in Sheets, Strips and Rolls

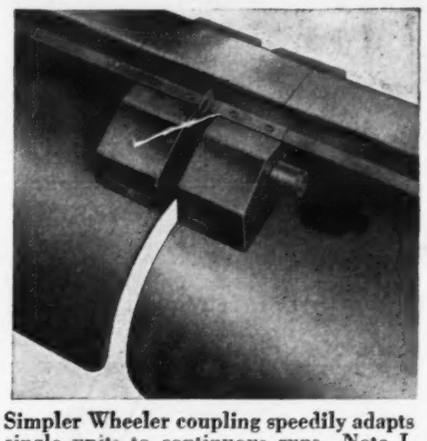
WAR CONTRACTS DIVISION
War Materiel

Check The Details—
See why Wheeler means
"Skilled Lighting!"

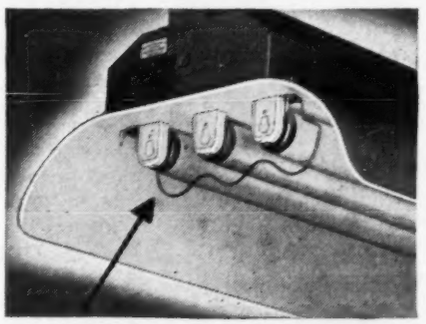
From end to end, Wheeler Reflectors are engineered with all the skill and experience of Wheeler's 62 years' specialization in lighting. They're "skilled lighting" that insures maximum lighting efficiency, durability, and convenience of installation and maintenance.

Examine a Wheeler Fluorescent Fixture, for example. Compare its high rigidity, obtained in spite of WPB metal-restriction, by Wheeler's I-beam wiring channel construction. Notice that wiring is *completely metal-enclosed,* yet instantly accessible. Also note the accessibility of starter switches; the speedy adaptability of the unit to continuous runs; and the ample provision of knock-outs for any type of mounting.

Whether you need fluorescent or incandescent fixtures, specify Wheeler and you'll get such "skilled lighting"! **Wheeler Reflector Co., 275 Congress St., Boston 10, Mass.** ... New York City. Representatives in principal cities.



Simpler Wheeler coupling speedily adapts single units to continuous runs. Note I-beam wiring channel design and accessible starter switches.



Another Wheeler improvement! New Lamp Retaining Guard for modern fluorescent fixtures. Provides new safety ... positively prevents falling lamps.

Distributed Exclusively Through Electrical Wholesalers

Wheeler REFLECTOR COMPANY

Lighting Equipment Specialists Since 1881

sentative in contacts with the American Standards Association.

•

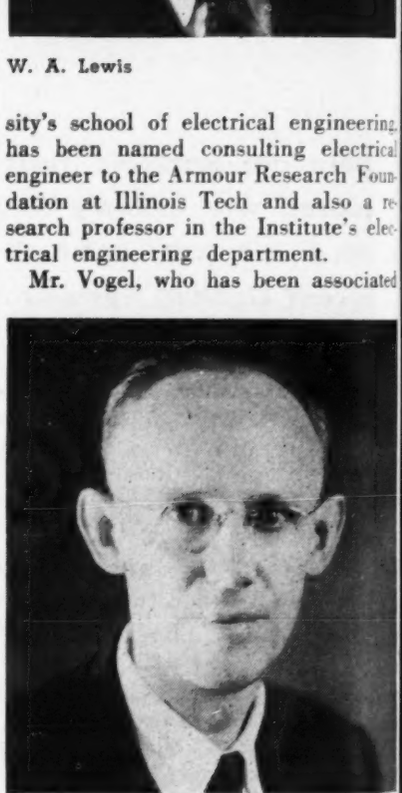
W. A. Lewis and F. J. Vogel Join Illinois "Tech"

Dr. William A. Lewis, Cornell University, and Fred J. Vogel, Westinghouse Electric & Manufacturing Co. have recently been appointed to the staff of Illinois Institute of Technology. Dr. Lewis, director of Cornell Univer-

W. A. Lewis

sity's school of electrical engineering, has been named consulting electrical engineer to the Armour Research Foundation at Illinois Tech and also a research professor in the Institute's electrical engineering department.

Mr. Vogel, who has been associated

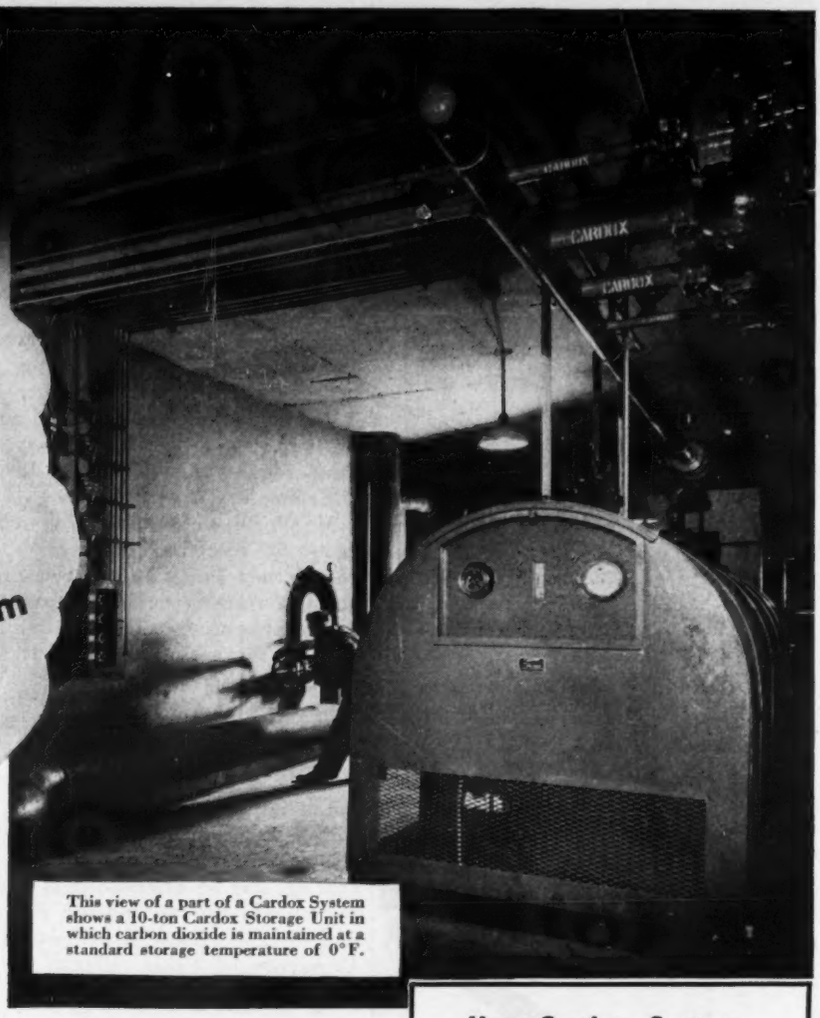


F. J. Vogel

with Westinghouse Electric & Manufacturing Co. for the past 24 years and who is an outstanding pioneer in the development of large power transformers, has been appointed professor of electrical engineering.

Mr. Vogel's appointment became ef-

Tough Fire Hazards "Engineered" this CARDOX Fire Extinguishing System



This view of a part of a Cardox System shows a 10-ton Cardox Storage Unit in which carbon dioxide is maintained at a standard storage temperature of 0°F.

Hazards in this plant involve the extensive use of flashy flammable liquids. Unless extinguished in a few seconds, fire could mean the total loss of precious materials and skilled man-hours.

Protection for these hazards is provided by a Cardox System . . . individually engineered to give the most effective application of Cardox CO_2 for the specific hazards protected by the system.

How This Cardox System Performs

Fire in any of these hazards is detected visually or automatically.

An alarm sounds, giving personnel notice to leave the fire zone. Time is allowed for complete evacuation of personnel.

A timed mass discharge of cold Cardox CO_2, released into the fire zone, reduces oxygen content of the atmosphere below combustion requirements and cools out the entire fire. So rapidly is the Cardox CO_2 discharged into the fire that burning time is usually cut to a very few seconds.

Since Cardox CO_2 is a non-damaging, non-contaminating inert gas, there is no damage or production delay caused by the extinguishing medium.

How Cardox Systems Provide Uniform Performance

Extinguishment of this kind is possible with a Cardox System, through engineered application of carbon dioxide maintained at a standard storage temperature of 0°F. Cardox CO_2 extinguishing performance is uniform, regardless of weather or plant operating temperature.

The advantage of uniform extinguishing performance can thus be provided in small or large systems, whether engineered for one or a number of hazards —indoors or out.

Convenient hose reels can be included in the system for fire that would call for local direct application of Cardox CO_2. For example, loading or unloading volatile and flammable liquids.

If you would like more information to help solve war plant fire protection problems of today . . . or in perfecting postwar plans for reducing loss of property and life by fire—write for Bulletin 514.

★ ★ ★

CARDOX CORPORATION
BELL BUILDING • CHICAGO 1, ILLINOIS

District Offices in New York • Washington
Detroit • Cleveland • Atlanta • Pittsburgh
San Francisco • Los Angeles • Seattle

How Cardox Systems Protect War Industries

- Timed discharges, as needed, through built-in piping systems . . . supplied instantly from a single storage unit holding tons (if required) of liquid Cardox CO_2.
- Mass discharge of Cardox CO_2 "knocks out" fire, by . . .
- Reducing oxygen content of the atmosphere below the concentration necessary for combustion, and . . .
- Cooling combustibles and fire zone below ignition temperature . . .
- Extinguishing fire quickly and completely *without* damage from extinguishing medium.

CARDOX—CO_2 Systems with Enhanced Fire Extinguishing Performance

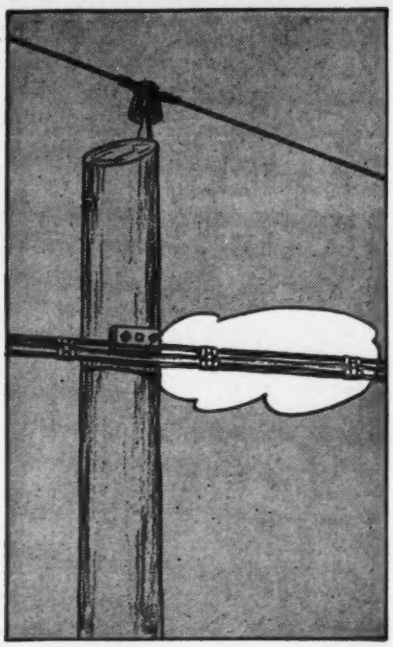
A. Uniformity of CO_2 characteristics.
B. Extinguishing medium with uniformly greater cooling effect.
C. Accurate projection of CO_2 through greater distances.
D. Timed discharges, as needed, through built-in piping systems . . . supplied quickly from a single tank holding tons of liquid Cardox CO_2.

MASS DISCHARGE OF CO_2 · ENHANCED COOLING EFFECT · CENTRAL STORAGE UNIT · AMPLE CO_2 RESERVE · ENGINEERED SYSTEMS · MANUAL OR AUTOMATIC CONTROL

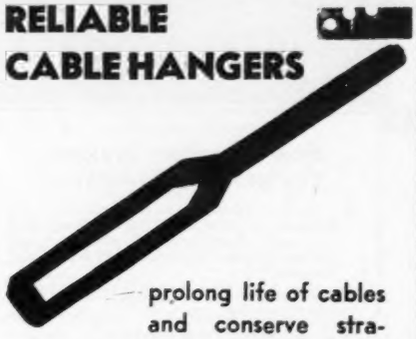
CARDOX

NON-DAMAGING FIRE EXTINGUISHING SYSTEMS

Reduce Outages
Avoid Cable Wear
Reduce Maintenance



RELIABLE CABLE HANGERS



prolong life of cables and conserve strategic materials by eliminating wear on cable sheaths or on insulation of hand made cables. Reliable cable hangers hold cable and messenger together tightly with wide bearing surfaces which eliminates snaking and chafing. They are easily applied and make installations that are permanent and very neat.

Reliable
ELECTRIC COMPANY
OVER 35 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE · CHICAGO, ILLINOIS

fective December 1, and Dr. Lewis assumed his new duties January 2.

Dr. Lewis, who has been director of electrical engineering at Cornell since 1939, has made notable contributions to power system relaying, the analyses of system stability, the derivation of transformer equivalent circuits and network calculator studies. Previous to his Cornell appointment, Dr. Lewis was associated with Westinghouse. He had charge of power system engineering application work for the New England and Pacific Coast districts from 1929 to 1939.

The author of a textbook and numerous technical articles, Dr. Lewis holds three degrees from California Institute of Technology.

Mr. Vogel, whose pioneering achievements in electrical engineering have also earned him national recognition, has just recently designed a new type of naval ordnance which has been adopted for use in World War II by the United States Navy.

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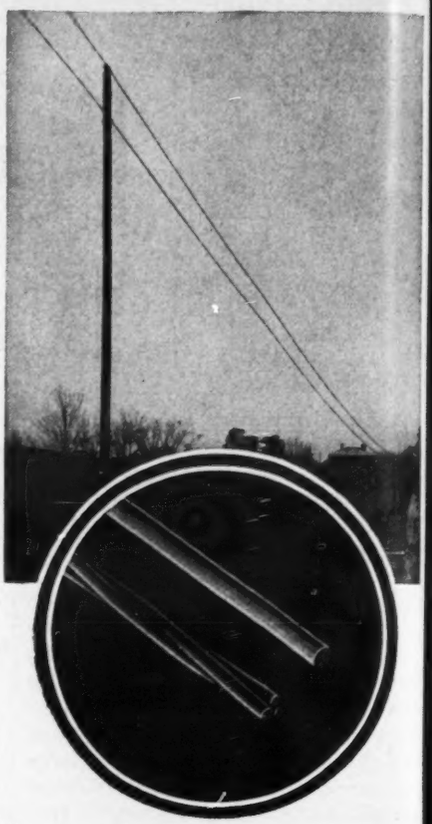
► LOUIS BALSAM has been appointed industrial relations officer in the personnel department, Simplex Wire & Cable Co., Cambridge, Mass. Mr. Balsam has had an extended industrial experience in Europe and the Far East, and for a year was a professor at the University of Pekin, China.

► W. M. STEARNS, manager of trade relations and special contracts for the General Electric Co., has retired after 39 years of service with that organization. Mr. Stearns will be succeeded by W. A. SREDENSCHEK, who for the past three years has been assistant manager of trade relations and special contracts.

► W. R. RICHARDSON, for many years foreman of testing, has been transferred to the electrical engineering laboratory, Simplex Wire & Cable Co., Cambridge, Mass., where he will be concerned with the construction and maintenance of specialized electrical testing equipment.

► I. W. KOKINS, vice-president of the Warren Telechron Co. since 1935, has been elected president of the company to succeed Henry E. Warren. Mr. Warren, founder of the company, resigned after having passed the retirement age. Mr. Kokins has spent more than 30 years in the electrical manufacturing industry. He joined the Warren Telechron Co. in 1926 as general manager and in 1935 was elected a director and later in that year became vice-president of the company. Mr. Kokins is active in the National Association of Manufacturers, being a member of the post-war committee. He also is a director of the

Crapo STEEL CONDUCTOR

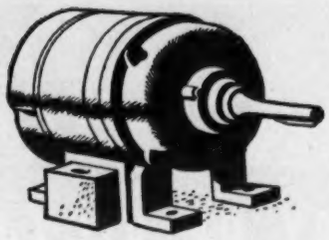


Rural distribution lines of *Crapo* Steel Conductor will prove efficient, economical and dependable for years under normal operating conditions. The rugged tensile strength inherent in this conductor makes possible long-span, low-cost construction requiring a minimum of maintenance. Relatively low 60-cycle resistance, low magnetic permeability and low 60-cycle reactance contribute to improved electrical efficiency.

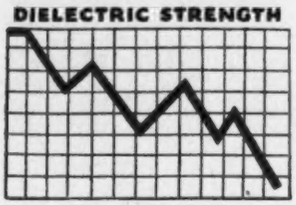
For rural extensions authorized by Utilities Order U-1-c, specify No. 6 B.W.G. *Crapo* HTC-130 Stranded (3-wire) Conductor—the size and type recommended for the purpose. For information on this or other applications, contact the nearest office of the Graybar Electric Co., Inc., Distributors, or write direct for Engineering Manual containing complete information on *Crapo* Steel Conductors.

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

1. Moisture can play hob around electrical equipment.



2. It can be absorbed into the insulation and lower its dielectric strength.



3. It can eventually result in all sorts of maintenance misery, as every engineer too well knows.

4. BUT THERE'S A PRACTICAL SOLUTION TO THE MOISTURE PROBLEM!

It's an insulation of glass...plus varnish

The *fibers* in all Fiberglas* Electrical Insulations are glass.

That's why they do not absorb moisture and thus they provide a better base for impregnation. As a result, the impregnated Fiberglas provides high resistance to destructive effects of moisture.

Similarly, most corrosive vapors do not attack this durable insulation, for the simple reason that glass fibers are unaffected by oils and acids (except hydrofluoric).

Before the war, alert engineers were skillfully adapting Fiberglas to many kinds of equipment working under tough conditions. Fiberglas gained wide acceptance as a superior electrical insulation.

For the same reasons, it has gained wide acceptance in the Army, Navy, and war industries for many types of motors, generators, and transformers—for wire and cable in planes, tanks, and ships.

As the production of Fiberglas Electrical Insulation is being constantly increased, more and more of this material is becoming available for more applications.

Many design engineers, now working with Fiberglas, are also looking ahead. They see how they will get outstanding performance with this glass material in all kinds of electrical equipment for postwar markets. They also know that Fiberglas gives them all the standard forms of electrical insulation to work with.

Those who have repair or rewind problems will also find it helpful to consult their electrical distributor regarding the possibility of using Fiberglas.

Owens-Corning Fiberglas Corporation, Toledo 1, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ontario.

FIBERGLAS*

*T. M. Reg. U.S. Pat. Off.

ELECTRICAL INSULATION

Today, Klein's are serving on war fronts all over the world and on the industrial front at home. These tools, famous for quality since the first Klein plier was made, are aiding America to "finish the job."

Under war conditions, electricians, linemen, and users of good tools everywhere are patriotically making their equipment last a little longer—give a little more service against the day when the Klein pliers they have always used will again be available.

Postwar plans call for an extensive development of power and communication lines. All of this will mean a bigger demand for tools than ever before. Klein's production of high quality tools in quantity for an America at war will be available to a peacetime America as soon as that war is won.

Keeping tools and equipment in good condition is important these days when tools are so vitally needed for war production. To aid in the care and proper use of tools, Klein has prepared this handy pocket guide which will be sent without charge to anyone interested.

ASK YOUR SUPPLIER

Foreign Distributors:
International Standard Electric Corp., New York

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

Clock Manufacturers Association of America.

OBITUARY

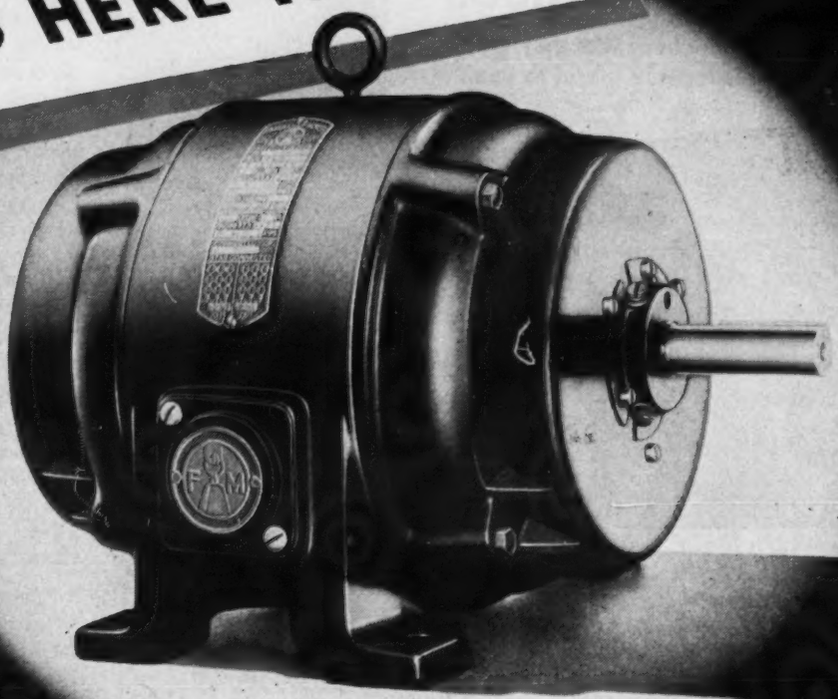
▶ ERLE F. WHITNEY, assistant district manager of General Electric Co.'s [illegible] central district for the past 14 years, died in Cleveland, Ohio, on December 12, following an illness of several months. A native of Bleakhouse Plantation, Miss., Mr. Whitney had been associated with the company since 19[illegible] when he was graduated from the Massachusetts Institute of Technology. His only leave from the company was during World War I. Before going to Cleveland in 1929 to assume the position which he held until his death Mr. Whitney was manager of the General Electric office in Portland, Ore., for six years. He was a director of the Electrical League of Cleveland, a member of the Cleveland Engineering Society and of the board of directors of the War Chest of Greater Cleveland.

▶ DANIEL P. MCKINNON, head of the land department of the Florida Power & Light Co., died on December 5 in Miami at the age of 49. Mr. McKinnon entered the employ of the Florida utility in 1925.

▶ JOHN S. RICHARDS, director of research of the American Steel & Wire Co., Cleveland, Ohio, died suddenly at his home in that city on December 2. Born in McKeesport, Pa., in 1894, Mr. Richards was graduated from the Carnegie Institute of Technology in Pittsburgh. After working for the National Tube Co. and the Carnegie Steel Co. he was made head chemist at the Donora, Pa., steel works of the American Steel & Wire Co. in 1928. Mr. Richards was moved to Cleveland as metallurgist in the main offices in 19[illegible] and was manager of the metallurgical division from 1937 to 1942, when he was appointed director of research.

▶ C. S. GRAHAM, utilities inspector and rate engineer with the electric department of the city of Jacksonville, Fla., died on November 30, at the age of 6[illegible] Mr. Graham first became associated with the city of Jacksonville in 1916 in the capacity of chief electrical inspector. He was promoted to utilities inspector and rate engineer in 1935. Mr. Graham received his engineering education at the Georgia School of Technology. He obtained a position with the construction department of the old Florida Electric Co. as a construction engineer. Subsequently he was identified with the Prairie Pebbel Phosphate Co. and the Gainesville Gas & Electric Co. Rejoining the Florida Electric Co. in Jacksonville, he was made superintendent of construction, and from that time until 1911 he handled a large vo[illegible]

TOMORROW'S MOTOR IS HERE TODAY!



WITH *Copperspun* ROTOR

YOU can buy this new postwar designed Fairbanks-Morse motor now—*knowing* that it will be just as modern—just as efficient—just as up to the minute in years to come as it is today.

It is indeed a challenge to the future—in efficient motor design.

- It is a 40°C. motor.
- It is a protected motor!
- It has the most adaptable, convenient, and handiest conduit box you ever laid your eyes on!
- It has the famous Fairbanks-Morse COPPER-SPUN Rotor!

Important!

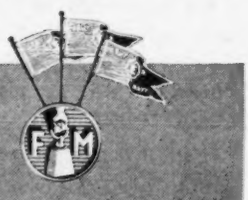
Never before has there been more stamina—more protection—more versatility built into a motor housing. A demonstration is necessary to fully appreciate how much this motor can really offer you. See it and judge for yourself.

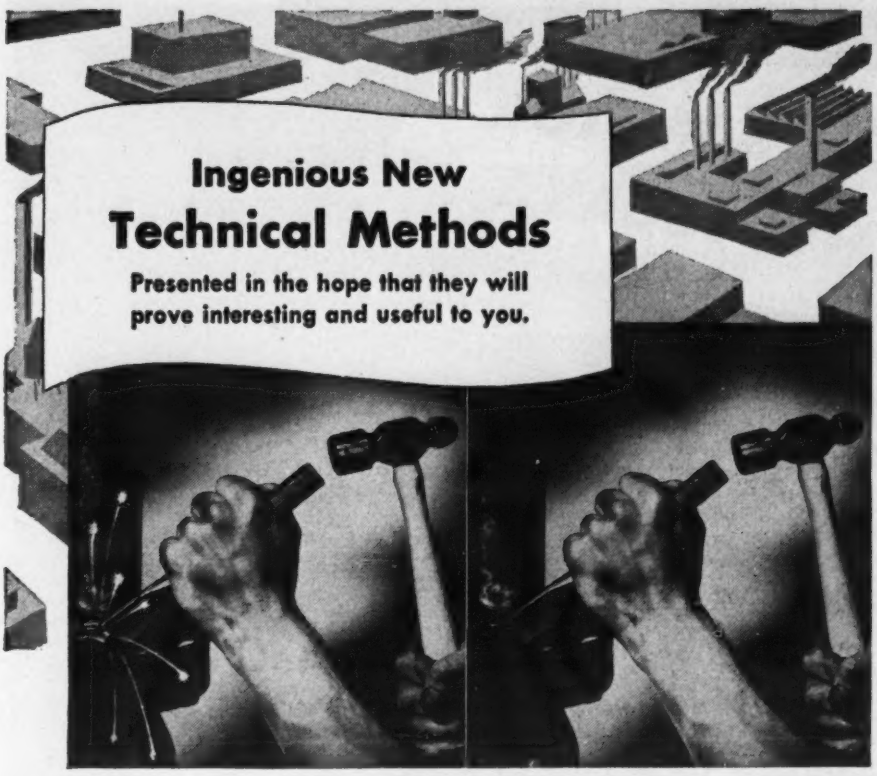
Write Fairbanks, Morse & Co., 242 Fairbanks-Morse Bldg., Chicago 5, Ill.

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT

Motors



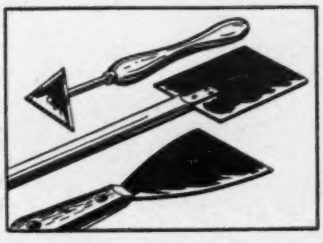


Beryllium Copper Bites Into Steel

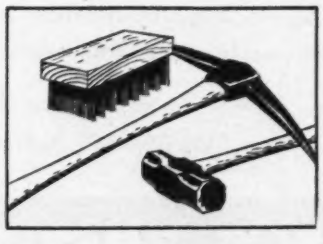
It is an old saying that when a dog bites a man it is not news, but when a man bites a dog it is news. That being the case, it is certainly news when copper bites into steel. Copper is, of course, one of the softer metals but when 2 percent beryllium is added to copper, its characteristics are changed. The alloy is heat treatable which explains the remarkable strength and hardness. Hit a chisel made of Beryllium Copper with a hammer and it will bite into steel without dulling the edge. Tools made of Beryllium Copper are non-sparking and therefore are used in ordnance plants, oil refineries and other places where explosions may occur from sparks off steel tools. Tensile strength as high as 200,000 lbs. psi can be obtained with Beryllium Copper; hence, it is used for many applications where resistance to high loading and impact fatigue are important, such as airplane motor bushings. Most of the critical springs and diaphragms used in aviation, Navy and Signal Corps instruments are made of Beryllium Copper because of its reliability as a spring material.

We hope this has proved interesting and useful to you just as Wrigley's Spearmint Gum is proving useful to millions of people working everywhere for victory.

You can get complete information about these tools from the Beryllium Corporation, Reading, Pennsylvania.



Man has tried for ages to rediscover the art of hardening copper. Today this can be done by adding to copper a small percentage of beryllium.



Not only does it produce an alloy harder than tempered steel, but one that does not produce sparks, an essential when working near highly combustible materials.

X-66

ume of electrical construction work in Florida and southern Georgia. When the Florida Electric Co. quit the construction business he went into partnership in the Ingram-Graham Electric Co. of Jacksonville. His connection with the city of Jacksonville followed in 1916. Mr. Graham played a major part in the development of that city. He became a member of the electric committee of the National Fire Protection Association in 1929. In 1931 he was elected president of the southern section of the International Association of Electrical Inspectors, and for many years he served as a member of Article Five committee of the National Electrical Code and gave considerable attention to the task of rewriting and coordinating the code. Four years ago he resigned from this work and was recently invited to rejoin, a request that he declined because of ill health.

▶ CHARLES BAILEY, for more than [illegible] years purchasing agent for the Commonwealth & Southern Corp. and its associated companies, died on December 16 at his home in New York after a brief illness. He was born in Mercer County, Pa., 55 years ago.

▶ CURTIS H. VEEDER, 81, founder of the Veeder Manufacturing Co. and a director of the Veeder-Root Company, Inc., Hartford, Conn., died in that city on December 27. In his early career he was employed by the then Thomson-Houston Electric Co., at Lynn, Mass., and was active as an engineer in the design of a pioneer electric locomotive, mining hoists, electromagnetic clutches and other equipment. In 1939 Lehigh University conferred upon him the honorary degree of doctor of engineering.

▶ EDWIN S. FICKES, who was a senior vice-president of the Aluminum Co. of America until his retirement six years ago, died on December 19 in Pasadena, Calif., where he had gone to spend the winter. His age was 71. A native of Steubenville, Ohio, and a graduate of Rensselaer Polytechnic Institute, Mr. Fickes became a superintendent of construction for an engineering firm in Pittsburgh. In 1898 he became affiliated with F. S. Pearson as designer and estimator of power stations, which were built in New York, Brazil, Sydney, Nova Scotia, and elsewhere in America and abroad. In 1899 he joined the Aluminum Co. at Niagara Falls. The following year Mr. Fickes was made chief engineer of the company with headquarters at the new Kensington works. Soon after he took over the design of all building, engineering and repair work. In 1919 he was promoted to a vice-presidency, and ten years later was elected a director. In 1931 Mr. Fickes was named a senior vice-president.

Day in and day out

LONG, UNINTERRUPTED SERVICE is the characteristic you want most in a capacitor. And that's the reputation of Tobe Capacitors, earned through an almost complete absence of "returns"! • Lasting stamina is built into Tobe Capacitors through every careful step in their manufacture...checked and cross-checked by frequent, rigid inspections. For your further assurance of complete satisfaction, every Tobe Capacitor is rated ultra-conservatively. • The Tobe Oil-Mite Capacitor shown below is oil-impregnated and oil-filled. It meets Army and Navy immersion tests. • The ingenuity of Tobe engineers is at your ready disposal in all capacitor problems. Inquiries will receive prompt attention.

LONG LIFE ASSURED!

TOBE DEUTSCHMANN CORP. TOBE CANTON • MASSACHUSETTS

SPECIFICATIONS—TYPE RAL 300 CAPACITOR

SHUNT RESISTANCE
1000 megohms or better

POWER FACTOR . . . .002—.005

WORKING VOLTAGE
400 Volts D. C. at 72° C.
600 Volts D. C. at 38° C.

INSULATING RESISTANCE—TERMINAL TO CASE 5000 megohms

CAPACITY . . . . . 5.0—5.0 Mfd.

DIMENSIONS . . . 2" x 3⅜" x 3¾"

Meets Army and Navy Immersion Tests

Oil Impregnated—Oil Filled

A small part in victory today . . . **A BIG PART IN INDUSTRY TOMORROW**

MANUFACTURING-MARKETS

Electrical Industry Sets Production Record

Emphasis during year on production devoted directly to war equipment — Leaders of electrical manufacturing industry buoyed by 1944 outlook

With a record year for both production and sales behind them, electrical manufacturers enter 1944 with the satisfaction of knowing that their 1943 production met the urgent requirements of the war program and was 20 percent more than in 1943.

War Equipment First

While emphasis during the year was on production devoted directly to war equipment, the electrical manufacturing industry was also called upon for new designs of apparatus for war production by other industries. Throughout the year research workers were called upon for the solution of numerous and important problems. Although their accomplishments are to some extent reflected in the year's progress report, still others will become apparent in the improved products of the future.

Alert to the realization of the necessity of continued production for 1944, electrical manufacturers are also cognizant of their responsibility to play a vital role in achieving post-war economy.

Comments at year's end of several such manufacturers follow:

R. C. MUIR, vice-president General Electric Co., Schenectady, New York—"The magnificent response of the electrical industry to the call for more and more war-needed equipment and how it met faster and ever faster production schedules is now well known, but not until the war has ended can the veil of secrecy be drawn back to disclose how the technical superiority of our war equipment was maintained while carrying on this phenomenal production. Any review of the year's activities of engineers, research workers, and manufacturing personnel can at this time merely indicate a few of their many brilliant achievements. Research workers and design engineers were called upon to produce new materials, with better qualities, to replace those made scarce or unavailable because of the war; to invent new methods of defense; and to create entirely new weapons. And in their development of these new, complex weapons there were no blueprints available—the devices had to be created."

GEORGE H. BUCHER, president Westinghouse Electric & Manufacturing Co., East Pittsburgh—"Not withstanding the fact that in the first nine months of this year we manufactured and shipped more apparatus than we did in the entire twelve months of 1942, our backlog of unfilled orders still continues to be over a billion dollars, if all plants under our management are included. This is the highest figure it has ever attained. The payrolls of the company have reached almost a million dollars a day. A recent survey of the gross earnings of employees shows that over 41,000 Westinghouse people will earn more than $3,000 each in 1943. This compares with 25,100 people who earned similar sums in 1942. . . . The Westinghouse Electric & Manufacturing Co. is one of the companies that will not require a major amount of reconversion in that it has been manufacturing in many of its plants the same type of products it manufactured in peace time, the only difference being in the volume and the maximum use of its facilities. Major reconversion expenses will occur in the electric appliance division where all normal activity has ceased. Reconversion of all our plants to peace time pursuits should be accomplished in a matter of months. And while the cost would amount to millions of dollars, yet it would not be an excessive burden on the company."

R. C. COSGROVE, vice-president and general manager, manufacturing division, Crosley Corp., Cincinnati—"We anticipate that our production will be confined exclusively to war products during the first half of 1944 and we are doing our utmost to keep our plants loaded to the maximum productive capacity, not only to provide all of the war material we are capable of producing but also, when we get into peace-

UNIVERSAL WIN ITS "E"—The Army-Navy "E" award for excellence in war production was presented to the employees of Landers, Frary & Clark, New Britain, Conn., recently. L. to r., R. L. White, president of the company; Gen. Guy H. Drewry, who presented the flag; Capt. A. K. Atkins, USN, who presented the pins, and James Degnan. This was the second time in the history of the company that Landers, Frary & Clark's war work was acknowledged officially. A certificate for outstanding work was presented to the company during the first World War.

ONLY AN ELECTRICAL WHOLESALER COULD THUS SPEED WAR PRODUCTION

Wesco effected pilot control of motors

Radical Use of Motor Starters Ended Sub-Chaser Space Problem; Saved 67% of Cost.

Installed in the sub-chaser were two ¾ h.p. direct current motors. The plan called for control of the motors from the pilot house but the space was too cramped to contain the standard direct current starters, each of which was 12" wide, 11⅜" deep and 14" high. Wesco engineers suggested a radical idea—the use of a type of linestarter employed in industrial plants. This starter is 4⅝" wide, 3⅞" deep and 7¼" high, and occupies only 1-15th the cubic bulk of the conventional starter.

The Navy engineers were dubious, but Wesco made a satisactory demonstration and won approval. Not only were the two small starters easily accommodated in the pilot house but, since they cost $6.50 each instead of $20.00, the Navy saved $13.50 on each starter plus a quantity of critical materials.

The ability to find practical and efficient solutions to seemingly impossible problems, has featured Wesco's speed-the-Victory service to war plants, the Army and the Navy. That ability will be at your command in 194X.

WESCO SPEEDS WAR PRODUCTION

* 190 separate electrical items, involving 45 manufacturers, were required for two 110-foot sub-chasers. Wesco ordered, assembled, and delivered each set of 190 units at a great saving in time and labor.
* Tie-up of a vital war plant was prevented when Wesco supplied 15 types of an "unobtainable" product —24 hours after receiving the order!

• • •

WESCO SERVES BUSINESS

* By knowing local and national codes and rulings.
* By furnishing informative and technical data.
* By warehousing stocks in anticipation of customers' needs.

SPEED OUR VICTORY
BUY WAR BONDS

Westinghouse Electric Supply Co.

150 VARICK STREET . . NEW YORK (13), N. Y.

A NATIONAL DISTRIBUTING ORGANIZATION WITH 80 BRANCHES

This Extra Deep Socket Insures Greater Mechanical Strength plus Higher Conductivity

Extra strength, to withstand any stresses — plus extra capacity to insure minimum IR drop! That's the combination that has made these Sherman Soldering Lugs the standard of the electrical industry.

Sherman Lugs are bright and clean, too, with no sharp edges or burrs — and the contact surfaces are FLAT.

Write for catalog which gives full specifications on a wide range of sizes and styles.

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICHIGAN

Sherman HEAVY DUTY SOLDERING LUGS

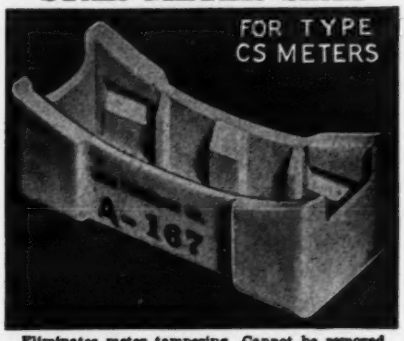
G.C.A.
Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks

Send for Catalogue

We have been making safety tools for 27 years

THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

STAR METER SEAL



Eliminates meter tampering. Cannot be removed without mutilating. SEND FOR SAMPLE.

STAR PORCELAIN CO.
51 Muirhead Ave. Trenton, N. J.

TRICO **COLORTOP FUSES** COLOR TELLS SIZE

The accepted standard of comparison for QUALITY, SERVICE and DEPENDABILITY.

ONLY COLORTOPS CAN GIVE YOU THESE "PLUS VALUES" . . . .

- Color rating indicator
- Porcelain shock-proof top
- Vent-proof top
- Large center contact rivet
- All soldered connections
- Guaranteed accuracy
- Distinctive modern design
- Underwriters Approval

YOU CAN'T GO WRONG WITH COLORTOPS!

Easy Selection
Quick Inspection
Instructive to Users

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

time production, to provide the fullest measure of employment possible. Our employed personnel has increased threefold during the past three years and is still increasing. In our present manufacture of war products—including electronic devices and various types of radio apparatus, bomber turrets, gyroscopic sights and similar products—our skilled personnel has, in many cases, originated, designed and produced entirely new devices and equipment."

GEORGE W. MASON, president Nash-Kelvinator Corp., Detroit—"Though our entire efforts are dedicated and will continue to be dedicated to our part in the winning of the war, we have not overlooked our obligation in planning for the post-war period. To this end, our executives are devoting much thought to the factors which will influence the design trend, manufacturing processes, distribution methods and sales possibilities of the future. Without taking any necessary effort away from our responsibility in connection with the war production program, we are planning and projecting so that at the proper time the company will be in a position to swing back to the manufacture of civilian products with a minimum loss of time. This program, we hope, will enable us to re-convert with the least possible dislocation of labor and with a minimum of temporary unemployment."

•

Circular F-Lamps May Make Debut After War

Three circular fluorescent lamps will probably be added to the line of lamps made by both the Westinghouse lamp division and General Electric lamp department as soon as conditions permit. Specifications of sizes to be produced and current consumption are as follows:

Approx. Over-all Outside Diam. of Circle	Maximum Bulb Size	Approximate Watts
8½ in.	T-10	20
12¼ in.	T-10	30
16 in.	T-10 or T-12	40

It is believed that there will be available a complete line of accessories for the new circular fluorescent lamps.

•

Cement Replaces Putty

After extensive research, Westinghouse chemists have developed a new cement to replace putty for glass instrument windows. This new synthetic cement seals the glass to the plastic instrument case far tighter than the putty formerly used. A simple, automatic machine applies a narrow band of the cement and the glass is pressed into place.

Fifth of a series of statements about ETL *comprehensive services*

COMPREHENSIVE SERVICES IN PROMOTION OF GOOD QUALITY IN LAMPS AND LIGHTING

The following four elements of ETL *comprehensive services* have been reviewed in earlier statements of this series:

INSPECTIONS AND TESTS AT FACTORIES
TESTS AT ETL HEADQUARTERS
INSPECTIONS AND INVESTIGATIONS IN SERVICE
RESEARCH AT ETL HEADQUARTERS

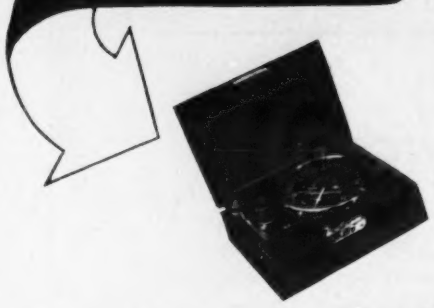
Each of the four supplements and contributes to the value of the other three. None alone can attain to full effectiveness without the others. All possess unusual value because of the independence of the testing agency. All are available to any who desire to retain ETL services.

These independent operations take place in the course of service to respectively producers and purchasers. Through them appropriate information from the experience of each becomes available to the other in a constructive manner.

Growing out of specialization on electric lamps, there has naturally evolved an interest and concern in the quality and performance of lighting accessories and in lighting practice. ETL is actively engaged in improving both the materials of illumination and the manner of their use.

ELECTRICAL TESTING LABORATORIES, INC.
2 EAST END AVENUE AT 79th STREET, NEW YORK 21, N.Y.

Choose a TACHOMETER For Heavy Duty



This sturdy, strong hand tachometer is always ready for immediate use. RPM and surface speeds are instantly indicated on the large easy-to-read dial. It is compact, accurate and thoroughly reliable. Single and triple range models up to 12,000 rpm. Write for engineering bulletin.

ASSOCIATED RESEARCH Incorporated
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THE ELECTRICAL BUYERS REFERENCE is packed full of buying and specifying information, all in one handy, ever-ready volume.

Active electrical men say it's the most valuable volume in their offices. Use it yourself . . . it's *your first source of information.*

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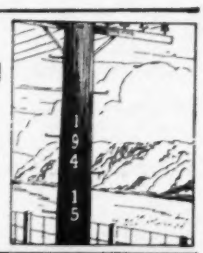
PREMAX

Renew Marking With Metal

The Premax Way costs less than stenciling . . . and outlasts the pole.



Premax Products

Division Chisholm-Ryder Co., Inc.
4418 Highland Ave., Niagara Falls, N. Y.

Field Reports on Business

Reports from the field indicate that several utility construction projects are soon to get under way. Street and industrial lighting is poised for more activity. Now that the Christmas spurt has subsided, retailers are faced with the problem of restocking their shelves.

NEW YORK

Department store sales last week were 22 percent higher than during the corresponding week a year ago, the Federal Reserve Board reported. The board added, however, that the large increase was due partly to Christmas falling on Saturday, permitting five days of heavy preholiday shopping in contrast with four days last year, when Christmas came on Friday. In the preceding week sales were 4 percent less than the similar period in 1942, while in the four weeks ended December 25 they totaled 5 percent more than the corresponding period last year.

As early reports indicated, retailers are faced with the problem of restocking their shelves. Lamps of all types were popular and the volume was high in small cotton and Oriental rugs. Some clearances were held to sell odds and ends, but no large markdowns prevailed.

Civil engineering construction volume in continental U. S., according to the *Engineering News-Record*, totaled $28,180,000 and is 19 percent lower than in the preceding week. This volume is also below the $76,295,000 reported for the holiday-shortened week in 1942. Current week's volume brings the 1943 construction total to $3,061,844,000, an average of $58,882,000 for each of the 52 weeks of the period. On the weekly average basis, 1943 construction is 66 percent lower than the $9,305,829,000 reported for the 53-week period in 1942. Private construction, $491,298,000 is 10 percent lower than a year ago, and public construction, $2,570,546,000, is down 70 percent when adjusted for the difference in the number of weeks.

PACIFIC COAST

Marine electrical fittings were an important source of Pacific Coast business during 1943, but indications point to a considerable cut in their local volume during 1944. Navy type 9-S fixtures are now bought chiefly in the East and warehoused in such Navy yards as Mare Island, which mainly supplies the Bay Region shipyards. Electrical fittings for Maritime Commission ships are now mostly bought in Washington, so that coast marine orders may henceforward largely cover miscellaneous and repair items.

War supply contracts awarded California during the first nine months of 1943 total $2,786,323,000, as compared with $6,382,587,000 during entire 1942. Aircraft firms received 80 percent of this 1943 volume. Two new reservoirs and three new power houses, costing $150,000,000, are contemplated by San Francisco's municipal Hetch Hetchy system, increasing its present capacity by 150 percent.

New government construction covers $10,000,000 of marine bases in San Diego and San Bernardino counties, including expanded electrical systems.

Orders and prospective orders include $24,905 G.E. load control, telemetering equipment for Tacoma, a low bid by Allis-Chalmers of $24,479 for six 1,667-kva. transformers for Los Angeles, wire rope for Ampere station of Bonneville system, $152,000 for gates, valves and cranes for Friant Dam of Central Valley project and a $56,819 low bid for lighting installation at Army Airfield in California. Bids are being recorded for 73 miles of 230-kv. (second) line of Grand Coulee system for completion by August 15, 1944.

CHICAGO

Several utility construction projects started or soon to begin brightened the electrical industry business horizon recently. In Iowa, for example, Iowa Public Service Co., Sioux Falls, plans extensions to a certain transmission. With the application made for permission, work is scheduled to begin soon, it is reported. Central States Electric Co., Cedar Rapids, also has filed for permission to extend a transmission line and a hearing is pending.

In Wisconsin the Richmond Center municipal utility has authorized surveys and cost estimates for expansion of the local power plant. Project will include a new turbine and boiler and is scheduled for post-war. In the same state, at Rotschild, Marathon Paper Co. is making surveys and cost estimates on improvements in power equipment and facilities at its mill.

Clearing Machine Corp., manufacturer of heavy hydraulic electric presses and forging machines, is again expanding its plant —for the fourth time.

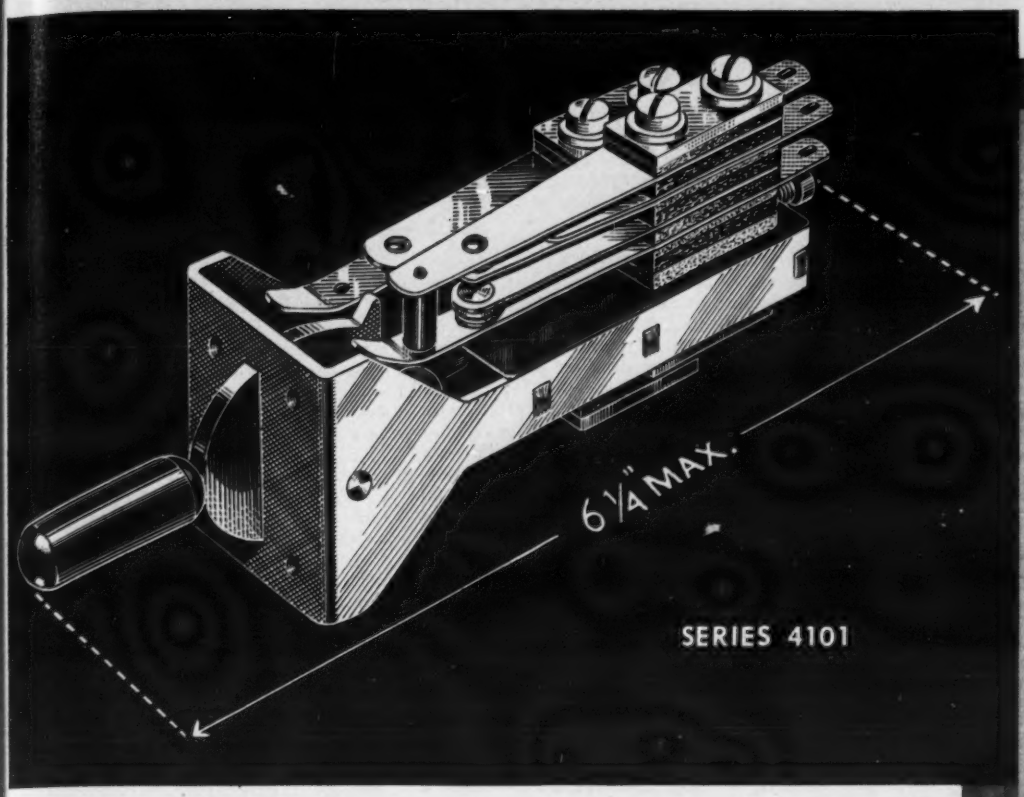
Galvin Manufacturing Co., Chicago, producer of radar and communication equipment, will soon break ground for a major extension to its plant here. Chicago Transformer Co. will also make an addition to present plant capacity, it is reported.

NEW ENGLAND

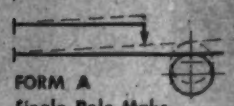
State and municipal contracts will be prominent post-war projects and are expected to total large sums for new construction and in rehabilitation of public institutions. Street and industrial lighting are poised for more activity, and installations of the latter type in greater Boston are increasing. Announcement of allocations of raw materials to manufacturers was received here as an indication of similar steps to follow in the not too distant future, particularly in the major household appliance line.

A $909,600 contract for the completion of runways for the East Boston state airport has been awarded to Gahagan Construction Co., New York, and will carry with it orders for special lighting equipment. Industrial lighting equipment sales are gaining in greater Boston, where last week extensions to a power line in one factory given to war production were begun, and two sizable installations of incandescents undertaken. The demand for 750-watt incandescent units for use over machines is stronger and orders for lots to 50 are now not uncommon; one sale called for a rush delivery of 120 fluorescents to a northern New England factory.

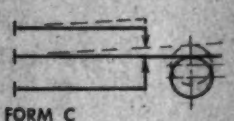
New England manufacturers bid on 350,000 ft. of electric cable, water heaters, and heating coils, capacitors, knife switches (one group of which aggregated 2,000), distribution type transformers, and supplies for light and power lines.



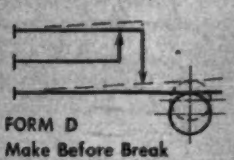
BASIC CONTACT FORMS

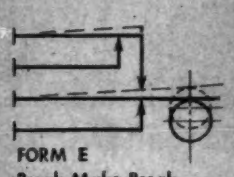

FORM A
Single Pole Make

FORM B
Single Pole Break


FORM C
Single Pole Double Throw

FORM C'
Single Pole Double Throw
Open Neutral


FORM D
Make Before Break


FORM E
Break-Make-Break

FOR GREAT FLEXIBILITY OF CONTACT ELEMENTS

Mossman 4101 Heavy Duty Lever Switch for Electrical Control

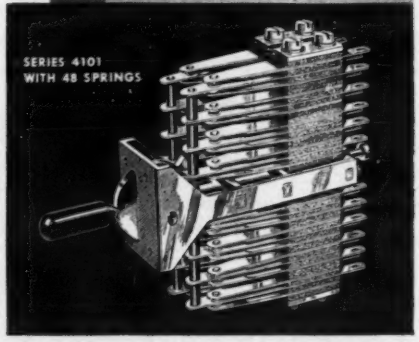
Utilities are finding an ever broadening field of usefulness for the Mossman 4101 Heavy Duty Lever Switch for such applications as:

1. Indication in remote control or telemetering circuits.
2. Supervisory control circuits in load dispatching.
3. Communication control circuits in utility and industrial plants.
4. Testing and calibration in meter departments and for tube testing.

The fact that the Mossman 4101 Switch is available in combinations as high as 12 springs per pile-up, 24 springs per position, or 48 springs total, permits a versatile control set-up of almost unlimited circuit arrangements.

Any combination of five basic contact forms may be built up for each individual application. Standard heavy duty contacts are of 3/16" diameter, fine silver—10 amperes, 110 volts A.C., non-inductive. Extra heavy duty contacts are of 5/16" silver alloy—20 amperes, 110 volts A.C., non-inductive. Breakdown rating of springs to ground is 2000 volts—alternating current.

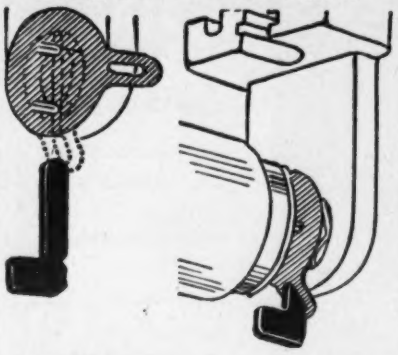
Write for the new catalog which pictures and describes this 4101 Switch and the full line of Mossman precision electrical components which includes many types of heavy duty, multiple circuit lever switches, turn switches, push switches, plug jacks and special switching components.



Donald P. Mossman Co., Inc.
6133 N. Northwest Highway, Chicago (31), Illinois

MOSSMAN
"Electrical Components"

"FLUR-O-LOCKS"



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It is a conceded fact that vibration at fluorescent lamp contacts considerably impairs the efficiency of lamps, starters and ballasts. Flur-o-locks aid materially in preventing this condition. Furthermore Flur-o-locks insure the proper installation of lamps and offer definite protection against accident hazards wherein lamps are apt to fall from a fixture. Such accidents have occurred causing quite some material damage and personal injury. FOR SAFETY AND CONSERVATION USE FLUR-O-LOCKS.

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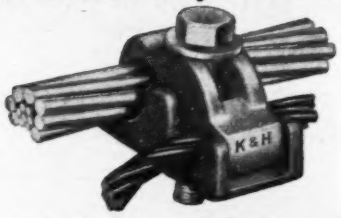

Effectively used as guy line ground, or transformer and lightning arrester connection to A. C. S. R. or copperweld conductors where the diameters may be from 8-A copperweld to .595" A. C. S. R. armour rods. Wire sizes .595" to 5/32".

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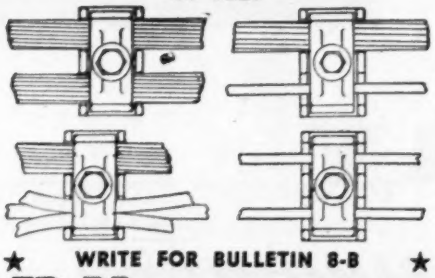

★ WRITE FOR BULLETIN 8-B ★

K&H KRUEGER & HUDEPOHL
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Sales Opportunities

OREGON—Portland General Electric Co., Portland, plans extensions and improvements in transmission line.

MICHIGAN—Olds Motor Works Division, General Motors Corp., Lansing, plans three large additions to plant, comprising heat-treating building, 240 by 600 ft.; hammer shop, 180 by 440 ft.; and die shop, about 180 by 190 ft., to be used for production of heavy-duty motor truck axles for government. Cost reported over $1,500,000 with machinery and electrical equipment. Work will begin soon and is scheduled for completion next spring. Engineering department of Argonaut Realty Co., General Motors Bldg., Detroit, another division of General Motors Corp., is in charge.

CALIFORNIA—War Department, Washington, D. C., has approved plans for expansion in an army air base, comprising shops, warehouses and other buildings, with mechanical and electrical equipment. Also additions in power substation facilities, distribution lines and service connections. Entire project will cost about $1,000,000, and will be supervised by U. S. District Engineer Office, Los Angeles. Contract for building erection has been let to Bressi & Bevanda Constructors, Inc., 6950 Tujunga Ave., North Hollywood.

WASHINGTON — Cowlitz County Public Utility District No. 1, Longview, plans new transmission line from power substation of BPA, to PUD substation. Program has secured a priority rating and work will be placed under way soon. After close of war, it is proposed to construct another line between same two points.

FLORIDA—Bureau of Yards and Docks, Navy Department, Washington, D. C., plans new airport, including hangars, shops, warehouses and other structures, with mechanical and electrical equipment. Also power substation unit, control tower, lighting system and other facilities. No estimate of cost announced. Robert & Co., Bona Allen Bldg., Atlanta, Ga., are consulting engineers.

ARIZONA—Phelps-Dodge Corp., Douglas, has plans maturing for new pumping station for water supply for mining properties, with installation to comprise five motor-driven vertical turbine pumps, with controls and accessory equipment. This is part of a water development to be carried out by company to cost in excess of $2,500,000. Project will be financed by Defense Plant Corp. Leeds, Hill, Barnard & Jewett, 601 West 5th St., Los Angeles, Calif., are consulting engineers.

LOUISIANA—Airport Committee, Chamber of Commerce, Opelousas, H. J. Wier, chairman, plans to begin work early in spring on new airport near city, comprising hangar, shops and other industrial buildings, with mechanical and electrical equipment. Also power substation facilities, distribution system, control station and other service installation. Cost estimated close to $886,000, with financing provided by government.

PENNSYLVANIA — Continental Distilling Corp., 1429 Walnut St., Philadelphia, will have plans prepared by United Engineers & Constructors, Inc., 1401 Arch St., Philadelphia, for proposed additions in plant for production for government. Cost estimated close to $2,000,000, with financing by Defense Plant Corp. Work is scheduled to begin at early date. Company is affiliated with Publicker Industrial Alcohol Co., first noted address.

MINNESOTA—Municipal Light & Power Department, Tyler, has authorized plans for expansion in municipal power station, with installation of additional equipment. Estimates of cost will be made. It is understood that development will be carried out as a post-war project.

FLORIDA—City Commission, Panama City, C. E. Swank, city manager, will receive bids until January 21 for extensions in water supply system, including pumping station, with motor-driven turbine pumping unit, controls and auxiliary equipment. Smith & Gillespie, Jacksonville, are consulting engineers.

COLORADO—Construction Service, Veterans' Administration, Washington, D. C., will receive bids until February 15 for additions to institution consisting of several buildings. Project will include complete electrical installation, comprising conduit system, outside electrical lines, electric elevator, lighting system and fixtures, ventilating system and other facilities.

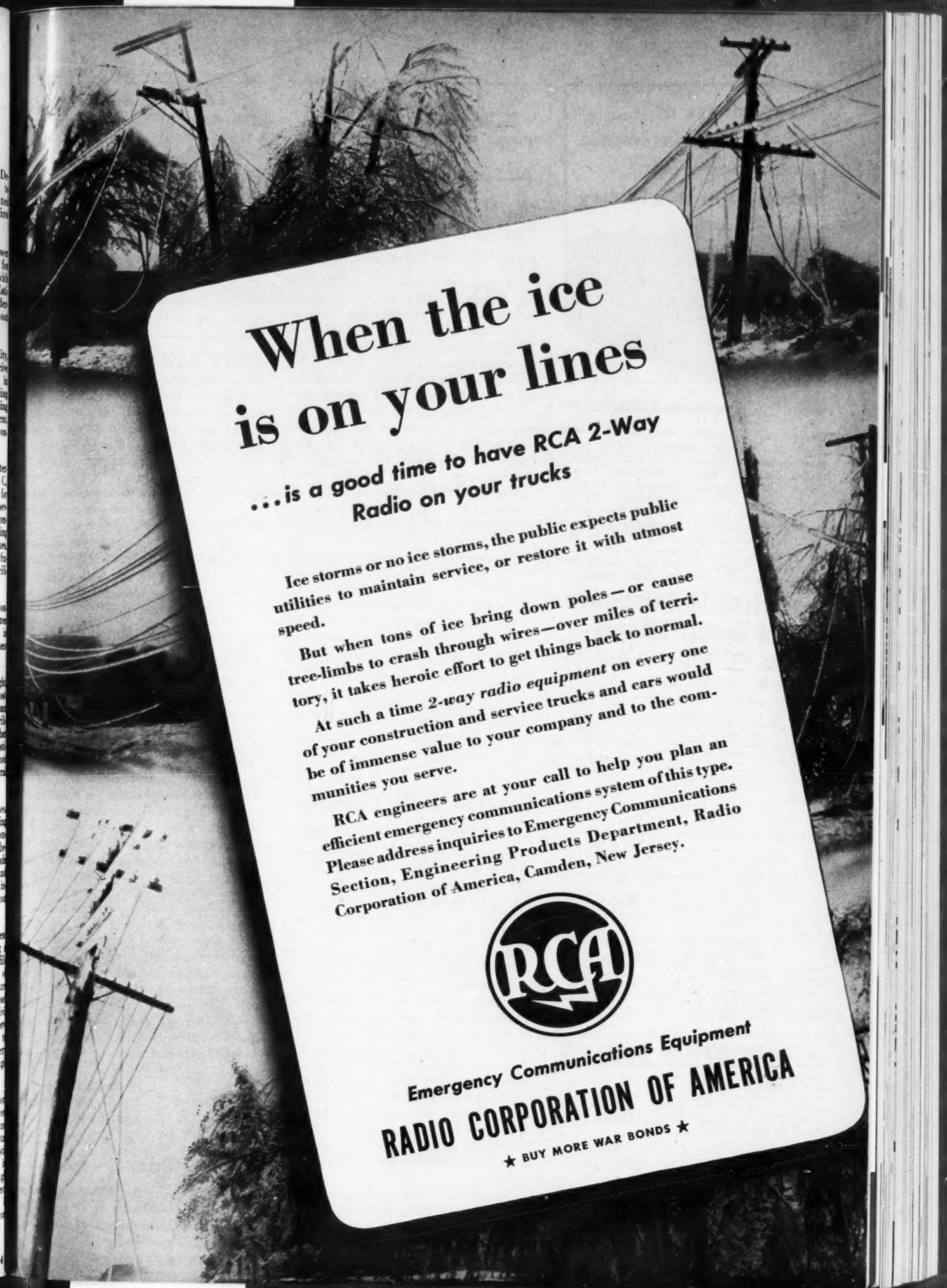
ILLINOIS—Illinois-Iowa Power Co., Monticello, plans extensions in distribution lines in parts of two counties for expansion in rural electric system, with service connections and other facilities.

CALIFORNIA—Bureau of Power and Light, Los Angeles, is arranging a six-year post-war expansion and improvement program in power plants, transmission and distributing lines, power substations and other plant structures to represent a total estimated investment in that period of about $20,000,000. H. A. Van Norman is general manager and chief engineer.

IOWA—Park Commission, Des Moines, Arthur Daniels, commissioner, is arranging a federal grant of about $800,000 for completion of municipal airport, originally begun as a WPA project. Work will include additional buildings, with mechanical and electrical equipment. It is proposed to install a lighting system to cost about $30,000.

MICHIGAN—General Motors Corp., General Motors Bldg., Detroit, is arranging post-war plant development for new affiliate now being organized under name of Diesel Equipment Division, to manufacture injectors and allied specialties for diesel engines produced by Diesel Engine Division of company. Plant will comprise several one-story buildings, and is reported to cost in excess of $500,000, with machinery and electrical equipment. Company engineering department will be in charge.

TEXAS—Board of Public Works, Fort Worth, plans installation of motor-driven pumping machinery, with controls and auxiliary equipment in new pumping station for municipal waterworks. Cost estimated about $103,900, and financing of that amount has been arranged through federal aid. It is understood that project will have a priority rating. Freese & Nichols, Capps Bldg., Fort Worth, are consulting engineers.



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LETTERS TO THE EDITOR

Did Not Pigeonhole Van Lear Report

To the Editor of ELECTRICAL WORLD:

On page 54 (2222) of your December 25 issue there is the following statement: "The report [Van Lear report] was pigeonholed, he said, by M. M. Samuels, then head of REA's research organization."

Those of your readers who know me need not be told that I never pigeonholed anything in my life. I have always been in favor of all engineers making all facts known to all other engineers, provided the figures are substantiated. In the specific case I considered it very fortunate for the engineering profession that a scholar of such high caliber and independent thinking as Dean (now Colonel) Van Lear agreed to undertake the preparation of the report and worked day and night on it.

Not only did I recommend the release of the report but its presentation before one of the national engineering societies. I did not know then and do not know now of any reason for withholding it.

M. M. SAMUELS, Chief
Technical Standards Division,
Rural Electrification Administration.

•

The Goal Is Not Fantastic

To the Editor of ELECTRICAL WORLD:

I read with interest your editorials "The Goal" and the "Elixir of Life," in the October 16 and November 13 issues. The goal you describe is by no means fantastic—it is quite capable of being reached. "Planned load building" is the answer, and I think that if these increased loads are to be attained soundly and profitably, utility sales managers are going to have to give a great deal of attention to at least the fundamentals of cost analysis. Building loads in the volume which you describe must be done on a "net revenue" rather than a gross revenue basis. Not only are we going to have to give a great deal of attention to the design of our rates and to keeping them as promotional as possible, but we are going to have to sell intelligently and scientifically in order to do the job properly.

I am sure you will be interested in the tabulation of kilowatt-hours per residential customer and price per kilowatt-hour for South Carolina Power Co. which I am attaching. You will note that from 1930 to 1936 we more than doubled our use per customer, and by the end of the current year it will again have approximately doubled. In 1944 we expect to sell 2,200 kw.-hr. per residential customer, and in the first "normal" year after the war we have set a goal—and I believe we can reach it—of 2,700 kw.-hr. per customer.

South Carolina Power Co.
Residential Electric Service

	Kw.-Hr. per Customer	Price per Kw.-Hr. (Cents)
1930	502	8.49
1931	593	7.95
1932	653	6.46
1933	676	6.08
1934	755	5.47
1935	916	4.53
1936	1,072	3.74
1937	1,212	3.57
1938	1,326	3.35
1939	1,413	3.19
1940	1,544	3.01
1941	1,661	2.96
1942	1,796	2.87
1943 (10 mo. act., 2 mo. est.)	2,050	2.75
1944 (Budget)	2,220	2.64

Your editorials are, in my opinion, very much "on the beam."

J. F. CRIST, Vice-President
South Carolina Power Co.
Charleston, S. C.

•

Three Methods for Control of Voltage Regulation

To the Editor of ELECTRICAL WORLD:

Referring to the October 2 issue of ELECTRICAL WORLD, on page 86, the upper illustration, "Standard distribution transformers on a multi-grounded common neutral system to give the effect of taps. . . ." I believe some misunderstanding may exist by having both lines extend upward from each primary winding; for example, in diagrams (b) and (c) if the primary neutral is connected to the 240-volt secondary leg, one 120-volt secondary coil of the transformer would be shorted if the right-hand primary lead were grounded.

I offer the following suggestion for your readers: If each right-hand line were deleted or construed as a "2,400-volt dimensional" line the diagrams would be more easily interpreted and the connections would be in keeping for a multigrounded common neutral system.

H. J. HENDERSON,
183 Serpentine Road,
Tenafly, N. J.

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$500,000 Dam Completed

Completion of the 500-foot concrete dam at the northeast end of the Willamette River Falls horseshoe has been

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We've heard all about the manpower shortage, but somehow we've got a feeling that there's a man around who would welcome this opportunity to get established with one of the world's largest publishing houses . . . McGraw-Hill. This particular job is vacant only because the man who held it has been moved up the ladder. In other words, it's no war baby.

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He likes to write. It's not painful for him to sit at a desk and pour out words. He expresses himself clearly on paper and enjoys doing it. Maybe he has written some advertising, edited a house organ, or handled publicity for a manufacturer—at least enough to get the taste of printer's ink and like the flavor.

He has a liking for research . . . . if he hasn't done much of it, at least he is curious enough to want to investigate things, and he has the patience and sound grasp of elementary mathematics that will enable him to supervise tabulations, work out the results in chart form, etc.

He has some technical background. If he's a full blown E.E., M.E., or something that would be fine . . . but all we really insist upon is that he has an understanding of things electrical . . . can go into a utility or an electrical contractor's shop and have a reasonable grasp of what goes on.

In replying tell us such facts as your age, draft status, salary desired and anything else that you think will help us fit you into the picture. The job is open right now, so the sooner the better.

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REA Allots $349,000 to Six Systems

The Rural Electrification Administration recently announced that loans totaling $349,000 had been made to six cooperatives in five states. The largest loan was made to the Mid-South Electric Cooperative Association, Navasota, Texas, $190,000, including funds for construction of 180 miles of line to serve 424 members.

Other allotments, to be used chiefly for extension of electric service to nearby farms meeting WPB standards outlined in the increased food production program, are as follows:

ARIZONA—Sulphur Springs Valley Electric Co-operative, Inc., Willcox, $10,000.

MINNESOTA—Wright-Hennepin Co-operative Electric Association, Maple Lake, $28,000.

NEBRASKA—Burt County Rural Public Power District, Tekamah, $60,000.

OKLAHOMA—Northeast Oklahoma Electric Co-operative, Inc., Vinita, $36,000.

TEXAS—Cap Rock Refrigeration Co-operative, Inc., Stanton, $25,000.

This brings REA allotments to $473,499,973, of which $6,551,678 represents operations during the current fiscal year.

•

Recent Rate Changes

IPSWICH, MASS., municipal lighting department made a reduction of one-half cent per kilowatt-hour beginning January 1 for energy sold to domestic and commercial customers, and also lowered power rates 10 percent. Increased consumption of energy permitted the cut.

PLYMOUTH, WIS., municipal electric utility has been authorized by the Wisconsin Public Service Commission to reduce its rates approximately $2,000 a year, effective January 15. The commission stated the cut would eliminate certain discriminations and materially simplify the utility's rate structure. About 60 percent of the 700 rural customers will benefit by the change.

CENTRAL NEW YORK POWER CORP. has been ordered by the New York Public Service Commission to reduce its street lighting rates in the village of Baldwinsville, Onondaga County, by $600 per annum. Upon recommendation of Commissioner Neal Brewster, who directed the proceeding, the commission requires the utility to submit by January 15, a schedule embodying the reduction. The village is now being billed on the basis of annual charges amounting to $6,440. A memorandum by Commissioner Brewster on the subject reviews the various factors involved in serving the village street lighting system and concludes that the cost to the company in supplying the serice is $5,860.

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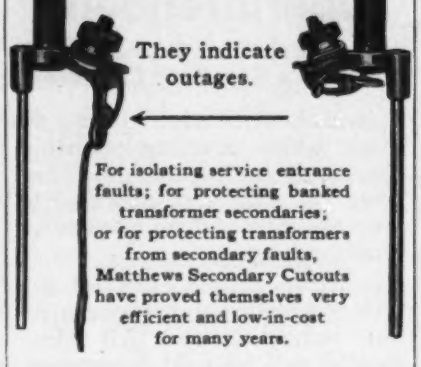

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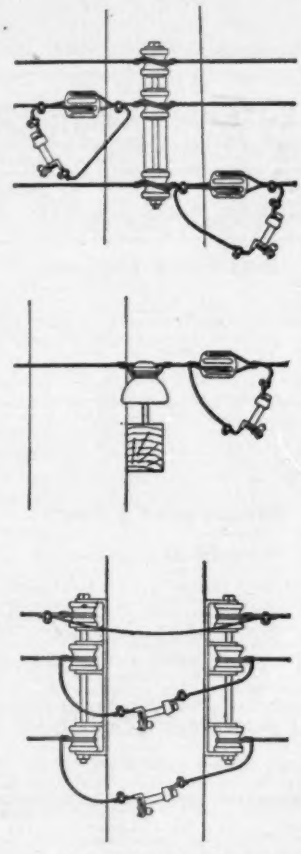

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NEW ADVERTISEMENTS received by 10 A. M., January 17th will appear in the January 22nd issue subject to limitations of space available

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for present and post-war position in New York City area

This man to take full charge of plant which is manufacturing electrical conduit fittings. Must have knowledge of machinery maintenance and all phases of foundry work.

Applicants should give full details of background, experience and salary desired. All information will be held in strictest confidence.

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OPPORTUNITY for patent solicitor with mechanical or electrical training in law firm. Position permanent and opportunity for professional advancement. State experience and professional qualifications. P-633, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

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GENERAL SUPERINTENDENT or Chief Engineer: Several years in charge of Engineering, Construction, Operation, Continuing Property Records—75,000 Meter System; 55,000 KW Generation. PW-634, Electrical World, 330 W. 42nd St., New York 18, N. Y.

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250 HP, 600 RPM, 4000 volt, G.E., sync.
250 HP, 600 RPM, 2200 volts, G.E., slip ring
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150 HP, 720 RPM, 440 volt, G.E., slip ring.
600 HP, 900 RPM, 440 volt, Lincoln, sl. rg.
150 HP, 400 RPM, 440 volt, G.E., sq. cg.
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100 HP, 900 RPM, 440 Westinghouse, sq. cg.
100 HP, 900 RPM, 440 volt, G.E., slip ring.
100 HP, 720 RPM, 440 volt, G.E., slip ring.
100 HP, 720 RPM, 440 volt, G.E., sq. cg.
100 HP, 600 RPM, 440 volt, G.E., slip ring.
100 HP, 600 RPM, 440 volt, G.E., sq. cg.
100 HP, 514 RPM, 440 volt, G.E., sq. cg.
100 HP, 450 RPM, 440 volt, G.E., sq. cg.
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75 HP, 900 RPM, 440 volt, G.E. sq. cg.
75 HP, 720 RPM, 440 volt, Westghse, slip ring.
75 HP, 720 RPM, 440 volt, G.E., sq. cg.
60 HP, 900 RPM, 440 volt, G.E., slip ring.
60 HP, 900 RPM, 440 volt, G.E., sq. cg.
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1—200 HP, 440 volt, 600 RPM, Crocker-Wheeler, slip ring.
1—300 HP, 720 RPM, 2200 volt, General Electric, slip ring.

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2—450 HP, 400 RPM, G.E.
1—250 HP, 760 RPM, Electro Dynamic.
1—150 HP, 750 RPM, Electro Dynamic.
3—150 HP, 400/550 RPM, Westinghouse, type SK.
1—125 HP, 600 RPM, Westinghouse, SK.
1—100 HP, G.E., 575 RPM.
1—100 HP, 625 RPM, G.E.
1—65 HP, 1000 RPM, G.E., type RC.
1—50 HP, 750 RPM, Westinghouse, type SK.
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3—50 KVA General Electric, 2200/220/110.
2—50 KVA, Pbgh. 7500/15,000 volts-110/220 volts.
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2—30 KVA, Allis Chalmers, 3 phase, 4156Y/120/208Y.
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2—100 HP, 475/1375 RPM, Electro Dynamic.
1—90 HP, 470/940 RPM, General Electric.
1—35 HP, 500/1500 RPM, Westinghouse.
1—30 HP, 225/900 RPM, Crocker Wheeler.
2—25 HP, 300/900 RPM, Electro Dynamic.
1—20 HP, 750/1500 RPM, General Electric.
1—15 HP, 300/1200 RPM, G.E.
1—13/13 HP, 350/1200 RPM, Electro Dynamic.
2—11½ HP, 500/1500 RPM, Westinghouse, type SK.
1—5 HP, 600/1200 RPM, General Electric.
1—5 HP, 450/1800 RPM, Crocker Wheeler.
1—5 HP, 400/1600 RPM, Diehl.
1—5 HP, 225/900 RPM, Electro Dynamic.

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IN INDIVIDUAL METAL ENCLOSURES

to 10,000 Amperes
Up to 600 Volts A-C
or 250 Volts D-C

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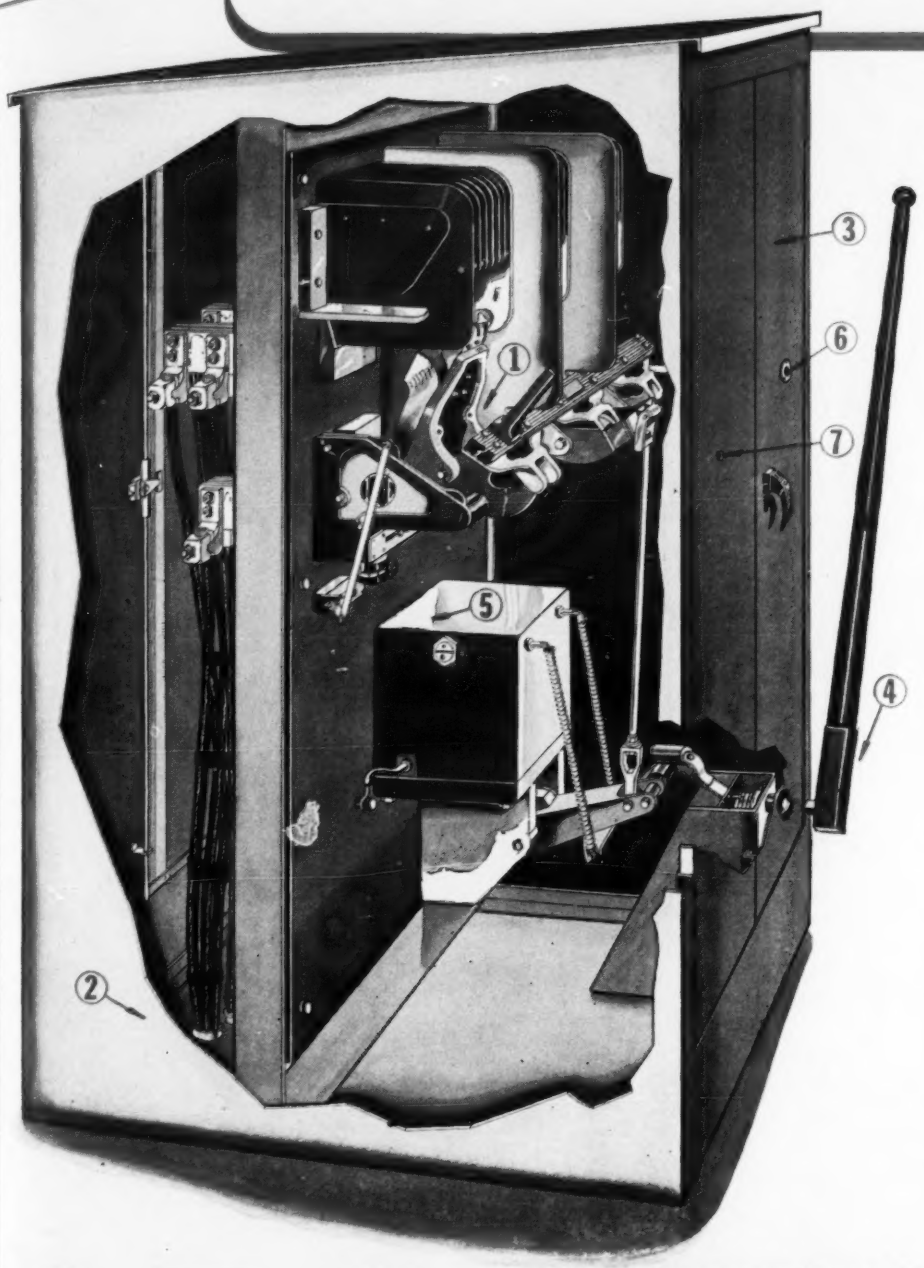

(1) The type LG trip free circuit breaker is fully enclosed and protected to give reliable performance.

(2) Steel enclosure protects breaker against accidental damage and prevents men working nearby from touching live parts. The cables may enter at top, bottom or side. Outdoor enclosures are weatherproof, with a sloping roof and projecting eaves.

(3) Hinged doors are easily opened for inspection without removing breaker from service. Three-point latches assure tight closure. Similar rear doors make the connection studs fully accessible.

(4) Outdoor breakers use a removable, rotary, manual operating handle, as shown here. Indoor types may have either a rotary or spade handle.

(5) Solenoid operating mechanism with a trip-free relay is provided for electrically operated breakers. Control power may be d-c or a-c.

(6) Trip button is readily accessible without opening the doors. In outdoor types this button is covered with a flexible, weatherproof diaphragm.

(7) Position indicator may be seen through a small window, showing whether breaker is open or closed.

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AIR SWITCHGEAR

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● OF COURSE, there's nothing unusual about a turbine oil lasting several years, if the operator wants to take the time and trouble to remove contaminants regularly. It *is* unusual, however, when a turbine oil lasts indefinitely, and does so without sweetening, batch treatment, resting, or replacement, and without any cleaning of the turbine. That is one distinguishing characteristic of Nonpareil Turbine Oil . . . another is the written guarantee with which it is sold.

By the terms of this guarantee—good for the life of the turbine—Nonpareil's acidity (as expressed by neutralization number) will never exceed the extremely low limit of 0.15. In actual practice, the neutralization number is more likely to be around 0.05, as has been proved in hundreds of turbines.

This ability to retain "new oil condition" is the result of Nonpareil's manufacturing process by which we entirely remove the highly unstable compounds, and inhibit the others against oxidation. Those that are removed would tend to form contaminants of asphaltene type. These are objectionable because they settle out, they may plug lines, and they cause water sludge deposits.

Nonpareil refining versus "conventional." The combination of advantages covered by the Nonpareil patent—the addition of an inhibitor to an oil from which all unstable compounds have been removed—is highly important. For the *mere elimination* of the unstable compounds has serious drawbacks—it removes the natural inhibitors. In fact, many of the asphaltene-formers p sibly most of them, are the natu hibitors. When all of them are ren the oil oxidizes to form acids wh turn contribute to emulsion and s formation.

To prevent this, the customary re ing method is to leave in the oil so the asphaltene-formers for their inhi ing effect—in spite of the certainty asphaltene deposits.

The Nonpareil method of adding inhibitor to asphaltene-free oil has obvious advantage of eliminating tr ble from both types of deposits. T explains why Nonpareil *can* be, and sold with a written guarantee and the guarantee is good for the life of turbine.

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